The Mysore Economic Journal

AUGUST 1920.

SPECIAL FEATURES.

Original articles on Economic subjects by writers of note; summary of articles of interest from Indian and Foreign Economic periodicals; selections from important speeches and papers on Economic subjects; notes of the month on current Economic matters; notes on various Economic activities in and outside the State and topical portraits and illustrations.

ANNUAL SUBSCRIPTION.

Mysore State	*Rs. 3.*
Outside Mysore State ...	*Rs. 4.*
Great Britain	*Sh. 8.*
America	*Dlrs. 2.*
Single copy	*As. 8.*

The JOURNAL is an excellent medium for Advertising all matters of Economic utility. The following is the schedule of rates :—

For full page Rs. 10 per insertion.
,, half ,, Rs. 6 ,,
,, quarter ,, 3½ ,,

One anna per line for special short advertisements not exceeding four lines each.

Contract rates on application.

For sample copy send eight annas stamp.

Correspondence and Contributions on all Economic subjects, especially those affecting the Mysore State, are invited from all who are interested in such matters. Accepted contributions are PAID FOR on publication of the same.

The Government of Mysore take no responsibility for opinions or views expressed in the JOURNAL.

All communications, business and literary, should be addressed to the Editor, "Mysore Economic Journal," Bangalore.

A Kannada edition of the JOURNAL is

DETAILED CONTENTS.

PAGE.

FINANCING OF BUILDING SOCIETIES—
By the Editor 509

INDIA THREE HUNDRED YEARS AGO—
By Gilbert Slater, M.A., D.Sc. ... 512

SURVEY OF THE GERMAN IRON AND STEEL INDUSTRY—
By C. J. Kavanagh 517

THE MEANING AND VALUE OF NATURE STUDY—
By A. Burnett-Hurst 524

PLEA FOR PAPER MILLS IN MYSORE—
By L. S. Subrahmanya Aiyar, B.A. 529

AID FOR RELEASED PRISONERS—
By the Inspector-General of Prisons, Madras 535

EDUCATION THROUGH SETTLEMENTS—
By C. R. Narayana Rao, M.A., L.T. 539

STATE-HELP TO INDUSTRIES ... 540

ECONOMICS IN THE WEST—
By Arnold Wright 542

INDUSTRIAL NOTES FROM THE U.S.A.—
By Alfred T. Marks 546

NOTES 550

GLEANINGS 552

ECONOMIC NOTES—
FRUIT CULTURE—
To Prevent the Rapid Decay of Ripe Fruit 553

COMMERCE AND INDUSTRIES—
Forest Research and Experiments in the Bombay Presidency 554
Preparation of Beeswax 556
Industrial Laboratories in Italy ... 557

BOOKS IN BRIEF 558

The Mysore Economic Journal

A Monthly Periodical devoted to the Discussion of all Economic Topics of Interest

PUBLISHED UNDER THE AUSPICES OF THE MYSORE ECONOMIC CONFERENCE

VOL. VI | AUGUST 1920 | No. 8

FINANCING OF BUILDING SOCIETIES.

BY THE EDITOR.

THE question of housing has been of late attracting considerable attention in India. Opinion is now unanimous that Government's responsibility in the matter of housing is one that cannot be avoided. The suggestion has been put forward that the requisite money may be found by the Government from its general revenues and that it may be lent by them to Co-operative Banks for being made available, on certain conditions, to Building Societies founded and run on co-operative lines. Some authorities consider that the question of housing should be handled only by Building Societies, whether worked by Co-operative institutions or by Joint-stock concerns it does not matter much. They object to municipal institutions undertaking housing work. A recent Report issued in Canada, where a committee studied the question in all its bearings, supports this view. It suggests that municipalities should do no more than provide the facilities for construction work. This duty in fact reduces itself in most cases to creating the amenities required for housing work to commence in any given area. These include in its opinion, the surveying of land, the laying out of roads, the marking of sites, the providing for drains, &c. &c. If municipalities do this part of the work for which they are best fitted, Building Societies would next step in and do he rest. Whether this view is accepted or not, and there is much to be said in its favor even in this country where the conditions are somewhat different from Canada, there can be no question that some active steps are necessary to promote building operations. The need for increased accommodation in urban areas is keenly felt by large classes of the population and a careful threshing out of the problem is necessary. It is a question if the housing of the poorest may not be considered as a problem by itself in large towns, where there is a large floating population dependent for its maintenance on particular industrial ventures. It seems necessary to bring home to these the duty incumbent on them for providing suitable living accommodation. This is the more necessary because it is this part of the population, living practically in the roads and lanes of large cities, that are most easily affected by diseases of various kinds and they unwittingly become the source of much danger to the rest of the people. That, however, is only one aspect of the question, though by no means an unimportant one.

The question of providing housing for the poorest of other kinds, including in this category those making their living from sundry trades and callings, is a more difficult one. For the men they work under cannot be expected to provide for them while they themselves are too poor to build or own houses. To these, particular attention deserves to be paid for they form at present

the majority of the people without facilities for housing themselves. In the case of these, it is our firm conviction, Building Co-operative Societies of a particular kind can do much good. Of a particular kind we say advisedly because large societies for building purposes are not likely to prove successful. They cannot also be easily financed. Supervision would prove difficult. And then it would be impossible to build simultaneously all the plots and complete the work within a given time. Experience shows that small and compact societies with a membership of forty or so, stand the best chance. A federation of such societies would be a consummation to be devoutly desired. Such a Federation would help in the wholesale purchase and manufacture of various articles required for house building purposes. Expert advice and guidance could also be arranged by a Federation more easily than by individual Societies. Such a Federation would also enable the Department of Co-operation to render more effectual aid in regard to finance and kindred matters. A similar plan would help towards the solution of the housing difficulties experienced by the poorer middle-class. What might be done for this is illustrated by at least one Society working in Bangalore City, which in a short time has enabled as many as forty people to build their own houses under its guidance and help. Similar Societies could easily do more, provided the Government and the Municipality concerned came to their active aid and managed housing operations through them. The initial cost of land purchase may in that case be reduced very considerably and those who now lock up their money in sites would be enabled to actually build. The Government would get a ground rent, possibly subject to revision once every 20 or 30 years and the Municipality a building assessment, subject as now to periodical revision. Both Government and people stand to gain by this mode of operations rather than by sale to the highest bidder—who often is moved to purchase to make a profit in the near future. The question is one well worth serious consideration and we should be glad to see it taken up by those interested in the subject.

We have left ourselves little space to consider the possibilities of Building Societies on the joint-stock plan. These have done much useful work in foreign countries and there is no reason why they should not succeed here. Under suitable management they ought to do well. In Bombay and Karachi, this work has been taken up in earnest by local people forming into joint-stock companies. Such companies can do much in a town like Bangalore, where there is so much still to be done to provide housing facilities for a growing population. Subarban areas can be opened by them with greater ease than by small Co-operative Societies and the railways that radiate from Bangalore can provide for the transit of the residents of such areas. This also deserves close examination.

A great deal, however, depends on the capacity to finance undertakings of this kind. Joint-stock companies may find their own capital but Co-operative Building Societies have to depend to a large extent, in the present circumstances, on Government aid. Banking is still undeveloped in this country and money got on the terms of a short-term deposit can hardly be invested in long-term loans. And Building Societies generally cannot do without long-term loans. In fact, the builder of a house on this plan should not be expected to pay as a monthly instalment on his whole loan more than what he would ordinarily pay as rent for thirty days for a house he might be expected with reason to occupy. The question as to how far Government can afford to lock up its money to an increasing extent on long-term loans for housing purposes has also to be carefully considered. No doubt Government's duty to its people is great. No doubt also that it must do sometimes what Banks cannot or

will not do. Still ways and means have to be considered. This being so, it is desirable to find a way out for Government. Even where its duty to act in a particular case is clear, Government is likely to lag behind if it cannot easily hit off a suitable plan of operations. If we concede that the existing number of houses are insufficient and that house building cannot keep pace with the requirements of the people, it follows that house building cannot be pushed through rapidly, or even proportionately to the needs of the country, without Government intervention. That Government can and should intervene is also conceded. What it should do is matter for consideration. It can help the Building or Housing Societies which work on principles other than than those indicated by the term "Joint-stock." The sort of societies which can be worked on a co-operative basis come under this head. Government would do well to consider the possibilities of a scheme for rendering financial aid to these Societies. As it may not be possible to find means to do this from general revenues, Government may, following the precedent of Western countries in this matter, seek a new source to tap for the required money. Now that house property in towns—for example, Bangalore—is passing into the hands of the richer classes and there has been a general rise in the value of both sites and houses, there is no reason why Government should not get a portion of the increment in the rent charged by landlords for houses or sites used for any kind of purpose. There is the greater reason to do this for the Government has by its grants to towns of this type increased its expenditure on them at the cost of the general tax-payer. It is necessary, therefore, that the general tax-payer should not be further taxed to make it the more comfortable for the rich man who invests in houses and in building sites to become richer. To relieve the general tax-payer from the burden of providing for further accommodation and to put a certain amount of responsibility on the owners of buildings who benefit now from the general rise in the rents paid, it might be useful to bring into existence what is known in certain countries, for instance Sweden, as an "Increased Rent Value Tax" in the from of an extraordinary temporary taxation of the increased net income from rents. The total amount collected in a year under this head may go to form the House-Building Fund of the State from which subventions to building Co-operative Societies, organized on definite lines and with definite programmes of work, may be made. The total subvention may be fixed for each year and made known to the Societies concerned. The demand on the fund for any year would not in that case exceed the amount set apart for the purpose for the year. Subventions to societies may take the form of (1) a loan free of interest for ten years, (2) a direct capital subvention up to 20 per cent of the cost of building, or (3) a loan ranging to 32 years with a nominal rate of interest, calculated on the basis of the up-keep of the Fund. Discretion may be allowed to combine in any case forms (2) and (3). The Fund itself would be worked by Government, though there is no reason why an Advisory Board of officials and non-officials should not be attached to it. The Fund should be kept apart from other Revenues, and administered by Government as a public trust would be. The amount to which it should be raised depends on the demands likely to be made on it. This can be worked out without difficulty if the general principle involved in its mainteuance is approved. The tax which is to feed it would be collected by the Municipalities concerned with the assessments and credited to Government accounts. Government may invest it or pay a small interest on it. The net rental value on any building would, for purposes of collection, be obtained by deducting the interests on the debts, if any, of the property, incidental expenses, repairs, insurances, consumption

of water, etc., calculated at a certain rate (usually $2\frac{1}{2}$ p. c.) for brick or stone houses and at a slightly higher rate (say 3 p. c.) for buildings of other materials. To avoid the tax becoming a burden on the owners of small houses, it need not be levied on houses the increased value of which does not amount to Rupees five hundred. A graduation in the tax may also be adopted, limiting the tax to 15 p. c. on houses the increased value of which does not exceed Rs. 800, and 25 p.c. for those exceeding Rs. 800.

The need for a Fund of this kind will be obvious to any one who remembers the demand for new houses in the bigger towns. There is a limit, as we have said, up to which Government can go with its limited Revenue. If more is demanded of it, new sources of revenue have to be pointed out to it. It is only then that it can be induced to take up the question. A tax of the kind proposed above is no injustice to house owners as they pay only on the increased values obtaining for their properties as the result of Government's own activities in the areas in which they are situate. Government creates the amenities and Government, therefore, is entitled to a portion of the unearned increment which now goes into the pockets of private owners.

A contemporary states that an important deposit of iron ore has been discovered in Morocco between the river El Abid and the Robia, in the neighbourhood of El Bourdoudj. The deposit is said to be on the surface of the ground, and to contain some hundred millions of tons of rich ore. Its development will be facilitated by the fact that power for driving machinery can be obtained from the river El Abid, and the transport problem will be solved by the construction of the railway which is to be built to connect the phosphate deposits at El Bourdoudj with the port of Casablanca.

INDIA THREE HUNDRED YEARS AGO.*

By Gilbert Slater, M.A., D.Sc.,

Professor of Economics, Madras University.

By the publication of this book Mr. Moreland has earned the sincere gratitude of students of Indian economics. It is scholarly, painstaking, and thorough in research, lucid in exposition of the results of research, and what is even more important, the evidence is weighed with a thoroughly judicious spirit. My own feeling after perusal is that at last a real, substantial beginning has been made in the writing of the economic history of India, and that at one and the same time a model worthy of imitation has been set before future writers, and a sound foundation laid on which future additions can be safely built.

Students of English economic history have been fortunate in having, in the Domesday Book, that tax-collector's survey of every inhabited village prepared by the orders of the Norman conqueror, a starting point from which to push their enquiries both forwards towards the present, and backwards into the remote past. And the value of Domesday is enhanced by the fact that it was compiled at the end of one political era and the beginning of another. So also for India, there is in the Ain-i-Akbari a survey of much of Northern India made under somewhat similar circumstances as Domesday, though failing to yield the same minute detail, and not yet exposed to the searching examination which great numbers of students have devoted to its English analogue. And the date of the Ain-i-Akbari, being also approximately the date of the coming of the East India Company to India, may well be

* *India at the Death of Akbar*, by N. H. Moreland, C.S.I., C.I.E., Macmillan & Co. 1920. 12s.

regarded as marking the beginning of a definite era in Indian history. Hence the investigation of India's economic condition at that date is specially hopeful from the point of view of attaining trustworthy results, and specially useful as a necessary preliminary to the study of the three centuries during which the destinies of India and Britain have been linked together.

The India which Mr. Moreland treats of is the modern Indian Empire without Burma. Politically it consisted of the Mogul Empire in the north, the disintegrating remains of the Empire of Vijayanagar, and various Moslem Kingdoms on the tableland of the Deccan. On the coast the Portuguese were established at the mouth of the Indus, they held the fortified posts of Diu and Daman on the two sides of the opening of the Gulf of Cambay, while their main stations were Goa, Calicut and Cochin. With other fortified posts at Ormuz and Colombo, and their important settlements in Africa, they endeavoured to control not only the whole of the trade between India and Europe, but also that between India and the far East, and even Indian coasting trade. The Dutch were on the eve of establishing themselves at Masulipatam. But no foreign power, unless the Moguls be considered foreigners, held any considerable power on land.

Mr. Moreland endeavours to form a rough estimate of the population of this vast district by some very ingenious calculations based, for North India, on the extent of cultivation reduced from the statistics in the Ain-i-Akbari, and for South India, from the information which has come down to us with regard to the strength of the armies of the Vijayanagar Empire. He comes to the conclusion that some parts of India were already very fully populated, but that many parts which now have a dense population, such as South and West Punjab, the United Provinces, North and East of the Gogra, and Bihar, were very sparsely occupied. His gross estimate for the total is one hundred millions, and he does not think that any Indian city had a greater population than half a million.

From the economic point of view Mr. Moreland classifies this population according to whether the economic importance of each section lay in their activities as producers or consumers. Under the former head he puts the classes engaged in (1) Agriculture, (2) Manufacture, and (3) Commerce. Under the latter (1) the Court and Governmental Service, (2) the professional and religious classes, including mendicants and ascetics, and (3) domestic servants and slaves.

In all essential respects agricultural production was carried on much as at present. The most important changes that have taken place are the introduction of some new profitable crops, such as groundnuts, and the expansion in the demand and production of others, such as jute, and the transformation of certain districts by irrigation works. All these tend to a larger production per head of rural population ; but, on the other hand, there may be some decrease in the average fertility of the soil under cultivation, through increase of population, and consequent extension of cultivation into new land, which is, presumably, on the average somewhat less fertile than that which was already tilled at the end of the sixteenth century. But again, we have to allow, on the other side, for the indirect advantages the cultivating class has gained from the improvement in the means of communication. Tools and implements have altered but little. The peasant to-day can get iron on more favourable terms, but probably has to pay more dearly for his working cattle. Hence it is hard to say whether the agricultural production per cultivated acre, or per agricultural family, has increased or decreased, but it is improbable that there has been any important change in either direction.

On the other hand there has been an important change in the distribution of the income won from the soil. Akbar's revenue drawn from any particular description of land was about four times as much as that now drawn by the State from the same land, reckoned in grain values. Hence the income left to the enjoyment of the peasant must have been considerally less under Akbar than now, while the advantages he derived from the Mogul Government consisted only of a very imperfect protection of life and property. The fluctuations of price in the local markets, in the absence of such restraining influences as railway communication, were undoubtedly very great, and the peasant, as a seller, was probably even more at the mercy of the trader than at present. On the other hand the trading classes had to carry on their activities in the face of great difficulties from the imperfection of the roads, and of dangers from dacoits, and therefore required very large margins between buying and selling prices in order to carry on their business continuously. In social status the actual workers were somewhat more depressed than now, as slavery was not uncommon, and those in a condition of serfdom, like the *padiyals* of to-day, were very numerous. And behind this somewhat hard condition of life there was the continual fear of starvation, resulting either from failure of rain, or from the ravages of war. Mr. Moreland dwells upon the change in the very significance of the word "famine." "A famine is now a period when distress is such as to require the intervention of the State, but if we were to rely upon the chroniclers of the sixteenth century, we should define it as a period when men and women were driven by hunger to eat human flesh. Badaoni wrote as follows of the famine of 1555: 'the author with his own eyes witnessed the fact that men ate their own kind, and the appearance of the famished sufferers was so hideous that one could scarcely look upon them. What with the scarcity of rain, the famine and the desolation, and what with uninterrupted warfare for two years, the whole country was a desert and no husbandmen remained to till the ground.' Of the same period Abul Fazl wrote that 'men were driven to the extremity of eating each other,' and of the later famine of 1596, we are told again that men ate their own kind, and that the streets and roads were blocked up with dead bodies." (pp. 127-8).

Of minerals the most important were copper, iron, salt and diamonds. Coal was not mined, and gold and silver were obtained, otherwise than by import, only in very small quantities. Copper was obtained in Rajputana, and some other districts, but not in large quantities, and it was very costly, and goods made of copper and brass were expensive luxuries inaccessible to the great mass of the population. Iron was produced in much larger quantities, and in many parts of the country, but its price, reckoned in grain, was about three times as high as in 1914, and the metal had to be used with great economy.

By far the most important of all Indian manufacturing industries was that of cotton. Cotton was not grown as intensively in particular districts as now, but the plant was even more widely diffused. The Indian manufacturer not only had a monopoly of the home market, but also carried on a considerable export trade; and a Portuguese observation has been put an record that "every one from the Cape of Good Hope to China, man and woman, is clothed from head to foot in the products of Indian looms." But this observation must be understood with the limiting clause "in so far as they are clothed at all," for between the cape of Good Hope and India the great mass of the inhabitants wore no clothing at all, and even in India the testimony of travellers is to the effect that the majority, at any rate of the men, possessed no clothing except a loin cloth. The Gulf of Cambay was the

centre of the largest export trade, collecting cloth from far in the interior, and sending it to Africa, Arabia and the Persian Gulf, and even to Malacca and China. Bengal and the Coromandel coast also produced cotton goods for export, chiefly to the Spice Islands and the Malay Peninsula.

Silk weaving was of some importance, Gujarat being the chief seat of manufacture, but here foreign competition was of importance, for the nobles on whose patronage the trade depended were avid of novelties, and silk goods are valuable enough to pay heavy transportation prices if they find a good market at the end of the journey. It so happens that there are materials for forming comparatively close estimate of the total output of this manufacture, and Mr. Moreland puts the total consumption of raw silk by Indian spinners and weavers at 3,000,000 lbs. of which about half a million pounds was imported. Since the pre-war consumption was about 4,000,000 lbs. it would appear that Indian silk manufacture has grown in actual volume but diminished relatively to the population. Jute appears to have been used pretty entensively for the manufacture of coarse clothing in Bengal. Other manufacturing industries and handicrafts were practised with much skill and in great variety in the various capitals, in order to meet the demands of ostentatious courtiers; but none of these was of any great economic importance.

The system of administration was somewhat different within Akbar's Empire from that in the independent kingdoms. In both a system of division into districts obtained; but while in the South each district was under the charge of a single officer who had to maintain a certain military force, and pay into the State Treasury a fixed annual sum, and beyond this was allowed to much as he liked and enrich himself as much as he could; on the other hand within the Mogul Empire a district had as a rule two officers, a military officer as well as a revenue officer, and they were paid fixed salaries, and had to account to the Imperial Treasury for all the moneys received in taxation. The salaries received by the higher officials of Akbar's Civil Service ranged from about 1,000 to 20,000 rupees per month, but it has to be remembered that the rupee of that time had about five or six times the purchasing power of that of the rupee of 1910—2, that is, at least ten times the purchasing power of the rupee of 1920. Hence under Akbar an officer of the rank of a member of the Executive Council received the equivalent of about *two lakhs of rupees*, of to-day *per month*! Almost all of these highly paid public servants were foreigners, and they owed their promotion to the Emperor's favour, obtained possibly by impressing him with their executive ability through some happy chance, and possibly by skilful flattery. Naturally the quest for Imperial favour was an intense gamble. One of Akbar's officers who started in life as a slave when he died left a fortune equivalent to a crore of rupees at pre-war values. But the number of disappointed and unsuccessful gamblers was, no doubt, in proportion to the richness of the prizes that attracted them. And the service was subject to the drawback that neither rank nor fortune could be passed on by the lucky individuals to their descendants, for the Emperor was the heir to all his officers. Hence though they might build up secret hoards for the benefit of their children in the hope that these might escape the vigilance of the tax collector, they were largely deprived of any motive for thrift, and the enormous salaries of the Emperor's favoured courtiers were spent lavishly.

Hence Akbar's court was extraordinarily luxurious and extravagant. The Imperial Zanana contained more than 5,000 ladies, each of whom had separate apartments; they were attended by a great staff of servants, and encircled by (1) female guards, (2) eunuchs, (3) Rajputs, (4) porters at the gates and troops all round the buildings.

Wherever the Emperor was, water was brought to him daily from the Ganges, ice from the Snow mountains, fruit from Kashmir, Afghanistan and even Turkestan. This pomp was imitated by the courteers in proportion to their means; and Golconda, Bijapur, Vijayanagar, Calicut, and even Goa, imitated the splendour of Agra or Delhi in a smaller scale. Vast numbers of the innumerable attendants who ministered to this display were either miserably paid free men, or even slaves; and slaves in India were both abundant and cheap. Some were, imported from Africa, but the great majority were natives of the country, and of slaves of local origin the supply did not fail, as in the extremity of distress caused either by failure of rain or by war or by the oppression and extortion practised by the more greedy and unscrupulous of provincial governors, parents were glad to sell their children as slaves to save their lives.

The above is in broad outline the picture of Indian Society as Mr. Moreland has been able to piece it together from contemporary observation and record. For the peasantry and craftsmen below, and the courtiers above made up Indian Society. The middle-class was practically non-existent.

It is very interesting that this book should have appeared in the very year in which the British rule in India has begun to give place to Indian self-government. For it enables us to summarise the successes and failures of British administration.

In making our estimate we must remember that the period intervening between the death of Akbar and the time when the authority of the East India Company became paramount, is about two centuries, and the period from then till now about one century. The earlier two centuries were the time of the decay and breaking up of the Mogul Empire, and they were marked by increasing disorder, warfare, social disintegration and economic deterioration. The first task, therefore, of the British in India during the last century may be said to have been the restoration of the degree of political efficiency and economic prosperity as existed under the last years of Akbar's reign. In this they have succeeded.

Their second task was to establish order and security of life and property and freedom of communications throughout India, to a far higher degree than had been attained even under Akbar. In this also they have succeeded.

Their third task was to cope with the recurring famines due to natural causes, and to convert the significance of famine from a time of widespread death by starvation and even cannibalism, into merely a time of famine works and gratuitous relief. In this they have succeeded.

Their fourth task was to create railways, roads, and irrigation works. In this they have done great things.

Their fifth task was by diffusion of education to make India a participator in the intellectual life of the world, and hence to give India national self-consciousness, and the capacity for self-government. How far they have succeeded in this, time will show.

Their last task the British administration was just beginning to recognise as its duty, but as more difficult duty than any of the preceding, when the decision came that the main responsibility for this service must be assumed by an Indian electorate and a representative system. That is the duty of lifting up the economic status of the ordinary Indian manual worker, whether peasant, agricultural labourer, or urban worker, above his traditional standard of a very bare subsistence.

In the above brief summary of the results of Mr. Moreland's investigations I have emphasized rather the points in which Akbar's India differs from India of to-day. But in so doing I have not conveyed the strongest impression which his book makes on my own mind. What in it strikes me most is the idea it conveys that for the labouring masses in India life is now, apart from the removal of fear of certain special

calamities, very much what it was three hundred years ago. The dominant economic fact then is the dominant fact now. And that is the fact that the Indian birth-rate is very high, and the Indian rate of industrial progress very low, so that if the death-rate were as moderate as it would probably be if the mass of the population were prosperous, there would be an annual addition to the population of India of some six millions human beings, with little chance of sufficient remunerative employment for these new comers. In other words the Malthusian theory of population applies to India. This fact is a good deal disguised by the publication of Governmental statistics of births and deaths without any warning to the reader that registration is very imperfect. A comparison between the census returns and the registration figures shows that the Indian birth-rate cannot be far short of 50 per thousand, and the total annual births must be somewhere in the neighbourhood of sixteen millions. In other words the number of annual *births* in India is about equal to the united *populations* of Canada and Australia!

To lift the mass of the Indian population out of its condition of poverty, *either* there must be so rapid a development of the productive powers of Indian agricultural and non-agriculture industry as to permit, at one and the same time, a tremendous increase of population and a substantial increase in the incomes of the labouring people, *or* there must be a radical change in the customs of the people with regard to marriage and parentage. The difficulty of effecting either of these changes is enormous. But neither is outside the range of possibility. Each of them demands the same psychological development as a preliminary. The average Indian of all classes must regulate his life more by calculation and forethought, and rebel more against his life being controlled for him by traditional habits, customs, beliefs and obligations, or by unrestrained natural instinct. It may well be that such a break with tradition, and such a painful intellectual development will be deemed too high a price to pay for escape from poverty; but the price, however high, is necessary; and if it be refused, the only alternative is for India to accept for future centuries a continuance of poverty.

We Britons may well be glad that the responsibility for making this decision will rest upon India herself, and not upon us.

SURVEY OF THE GERMAN IRON AND STEEL INDUSTRY.*

By C. J. Kavanagh,

British Commercial Commissioner at Cologne.

[The following is a comparison of the present position with pre-war years, indicating how the re-grouping of interests, is going on in Germany in the iron and steel industry. This article should prove of special interest to all those who are interested in the iron and steel industry in this country.—Ed., *M. E. J.*]

A review of the present position of the German iron and steel industry is of interest to the iron and steel producers and manufacturers in the British Empire, in view of the altered conditions under which Germany now manufactures.

The cession of Lorrine and the new status of Luxemburg and the Saar Basin has altered Germany's manufacturing capacity, and British interests must be placed in a position to judge the extent of the competitive role which Germany will be competent to play in the future.

It is not yet possible to deal with the subject on any but the most general lines, as the position, outside of the net losses to Germany, is still in a state of flux, and many months must elapse before there is any definite clarity in the situation. A general survey at the present time should, however, be of assistance to Empire interests in enabling them to anticipate Germany's future importance as an iron and steel producer. New factors in the industry also deserve the closest attention—that is, the possible effect on output of the transference of German establishments to French control; again, to what extent an agreement on a working basis

*With acknowledgments to the *Board of Trade Journal.*

may be formed between French and German interests; and finally, in view of American participation in the Allgemeine Elektrizitats-Gesellschaft to what extent some co-operation from that side with the German smelting and refining industry may be attempted.

GENERAL POSITION.

The shifting of the centre of gravity of iron and steel production from German to French hands deprives Germany to a very great extent of her control of essential raw materials, and will have a far reaching effect, not only on her steel industry, but on her vast complexity of engineering and allied trades, including shipbuilding, which she had built up under previous conditions. The net annual losses in steel production with which she is faced through loss of control of Lorraine, Luxemburg and the Saar, are but little short of her previous exports of iron and steel goods, including rolling mill products and machines, and amount to about 5¾ million tons.

It is estimated that about one-half of the pre-war iron and steel output of Germany was worked up into some form or other of export articles, and represented about 20 per cent of the total value of exports.

Germany's importance as a steel producer was founded chiefly on the Lorraine resources of minette ore, the efficient exploitation of which led to the mass production which made itself very keenly felt in the outside market, not only in steel, but in almost every class of engineering product. The ceded portion of Lorraine was responsible for 75 per cent of the total German pre-war production of ores, whereas Lorraine and Luxemburg together supplied above 79 per cent of the whole ore production expressed in iron content. There were in 1913, in Lorraine 65 blast furnaces, producing nearly 4 million tons of iron, or 20 per cent of the whole German production, and it is estimated that the total invested capital in pre-war values ranged from between 500 to 600 million marks. Further Lorraine ores fed the Saar works and in addition supplied about 15 per cent of Rhineland-Westphalian requirements.

In latter years German industry was attracted to Lorraine and the Saar by the advantages offered by proximity to the ore fields, and many of their most modern works were established there, besides which she had further begun a penetration into the French minette fields, and acquired interests also in Normandy.

In Lorraine an impetus has been given to mild-steel production by technical developments in the utilization of waste gases from blast furnaces, and the importance of this district as a producing centre is likely to increase under the altered conditions. What developments are likely to take place in respect of the relationship of German works in the Rhineland to French interest it is difficult to foretell and will depend largely upon the course of agreement with France.

The competition which Rhineland-Westphalia and the remaining German works will have to face from the Lorraine, Luxemburg and Saar steel works, with their modern equipment and other economic advantages, will be felt very keenly.

The Saar blast furnaces produced about 7 per cent of the total German production of pig-iron, and the importance of this district as a coal producer gave her a very strong position, her coal output in 1913 amounting to some 17 million tons, and representing about 9½ per cent of the total German output.

In raw steel the production of the Saar Basin was greater still than the pig-iron output, and amounted to nearly 12 per cent of the whole 1913 German total, and to this end drew supplies of pig-iron from Lorraine and Luxemburg.

In Luxemburg there were 41 blast furnaces, the interests in the smelting and refining industry being predominantly German.

PIG-IRON.

Germany, in pig-iron production alone, occupied with a capacity of 19·3 million

tons, second place to America, and her production exceeded that of the United Kingdom by about 8·7 million tons. Her present capacity as a pig-iron producer, were she working on full output, which she is not owing to the great shortage of coal and ores, would approximately place her on a level with the United Kingdom, while France will occupy second place on the list; and a Franco-Luxemburg-Belgian combination prove very formidable when normal conditions of working return. That some attempt at syndication in this direction will be made is certain, especially with the profitable example afforded of the working and results of the German Pig-Iron and Steel Syndicates in the days before the war. Certain fusions of interests and the purchase by Franco-Belgian groups of steel works in the Saar, and Luxemburg and Lorraine, point to the fact that those interests are fully alive to the possibilities that now lie before them, and although complete particulars of these are lacking, an attempt is made below to set down what has already been reported to have transpired in this direction.

SMELTING.

To Germany remains something over a half of her smelting industry, and the greater part of her refining and metal consuming works, but without the facilities she formerly possessed of feeding them with raw materials won largely within her own frontiers—a factor of prime importance in the history of her development as an industrial nation. Further, the favourable freight rates which German industry enjoyed through Lorraine, Luxemburg and the Saar now fall away, and the increased costs of transport within her own frontiers will have an appreciable effect on her cost of production.

Rhineland-Westphalian imports of foreign ores in 1913 amounted to 50 per cent of her consumption, and with the loss of Lorraine supplying 15 per cent, this district alone has to face imports to the extent of 65 per cent of her requirements from foreign sources, which, with her depreciated currency and ore debts multiplied in ratio to the fall in exchange renders her economic situation very acute, and her industry less formidable as a competitor in view of the diminution of output and increased costs of production.

A correct appreciation of the economic changes, either in their scope or final result, is difficult, but if beyond the positive loss sustained by Germany, the severance of her arteries of supply, and the dislocation of the financial and commercial means of working with districts with which she had the closest co-operation are taken into consideration, it will be seen that Germany's future importance as a steel and iron producer is dependent upon her financial rehabilitation as well as upon the course of economic agreement with France.

In her production of coal, or rather coke, she has one factor with which to bargain, but which for the time is withheld by the clauses of the Treaty of Peace, requiring delivery of certain amounts of her output to Allied countries.

FRANCE'S POSITION.

France, by the acquisition of Lorraine, and co-operation with Luxemburg and Belgium, is on the other hand afforded the possibility of rounding off her industry in a very convenient fashion, as the following figures will show.

ORE PRODUCTION.

	Tons.
Nancy-Longwy-Briey Basin ..	19,499,000
Other French sources, Normandy ...	2,215,000
Lorraine	21,133,000
Luxemburg	7,331,000
Belgium	200,000
Total ...	50,378,008

PIG IRON.

	Tons.
France	5,310,000
Lorraine	3,870,000
Luxemburg	2,548,000
Belgium	2,476,000
... Total	14,204,000

This requires about 45 million tons of ore of an average iron content of 30 per cent, thus leaving a surplus of about 5 million tons, of which the Saar district, now under the French sphere of influence, and producing a further 1,374,000 tons of pig-iron, will consume some 4 million tons.

These figures, accounting for nearly the total of French production, are not strictly accurate, as no consideration has been taken of Germany's previous imports of Swedish and Spanish ores which found part distribution to Saar and Luxemburg works, and they are further based on the assumption that the blast furnace capacity is working continuously on full output. Nevertheless, the *figures given go to show approximately* the change of position and its potentialities.

The production of France, neglecting *Luxemburg and Belgium, under normal* conditions, will double itself, as the following table shows, but due regard must be taken of the damage inflicted upon her works by the war, which will require some time to repair, and the acute shortage of coal and coke.

	Pig iron. Million Tons.	Steel. Million Tons.
France	5·31	4·63
Alsace-Lorraine	3·87	2·28
Saar Basin	1·37	2·08
Total	10·55	9·99

It is difficult to ascertain in what measure the control by the French of basic raw materials will react upon German engineering industries, but the present French activities foreshadow that such of those works as lie in Luxemburg and the Saar will become assimilated, whereas the works within the present German boundries will be to a great extent dependent upon France, and will not enjoy *the advantages of cheap raw material to any* extent approaching those afforded them by pre-war relationships.

GERMANY'S PRE-WAR OUTPUT.

In order to present a more complete picture of the change in Germany's position it *is thought that the following additional parti*culars of pre-war output should be added.

The 1913 ore production, according to grades, amounted to the undermentioned quantities :—

	Tons
German minette	21,136,265
Luxemburg ,,	7,333,382
Brown iron stone :—	
12 per cent manganese	3,005,970
12 to 30 per cent manganese	330,037
Manganese ore, over 30 per cent	760
Hematite	1,102,067
Siderite	2,860,811
Magnetite	31,587
Blackband	57,827
Flusseisen stone	42,167
"Rasen" iron stone	36,346
Coloured ore	4,066
Total	35,941,285

Exclusive of Luxemburg the 1913 production was therefore 28,607,903 tons, of which Lorraine delivered 74 per cent, and Lorraine and Luxemburg together 79 per cent, leaving now under the German sphere of control, *without taking into consideration any new* developments in other German deposits, 21 per cent.

PRE-WAR ORE IMPORTS.

The German production in 1913, however, did not in itself suffice for her own requirements, and she imported in that year a total of *14,019,045 tons from the following sour*ces :—

	Tons.
Sweden	4,558,362
Spain	3,632,058
France (and Belgium)	3,938,017
Russia	489,381
Algiers and Tunis	617,567
Austria-Hungary	105,982
Newfoundland	121,175

Of this total, 2.6 million tons, consisting of two-thirds of Luxemburg ores, was re-exported to France and Belgium, leaving a net import of 11,406,000 tons.

The present position is, therefore, that Germany's remaining ore deposits at their

present rate of production cannot nearly supply her requirements, and she will be obliged in future to make up by import of foreign ores, chiefly of Lorraine, Swedish and Spanish origin. Nova Scotian output would possibly find a market were freight available and prices competitive.

GERMAN PIG-IRON PRODUCTION IN 1913

Dealing now with the pig-iron production of Germany, this in 1913 amounted to 19,291,920 tons, made up in qualities as follows :—

	Tons.
Foundry (0·4—0·8 per cent P.) ...	3,640,074
Bessemer (0·07—0·08 per cent P.)..	368,840
Thomas	12,193,336
Spiegeleisen	2,599,887
Puddle iron	489,783

The distribution of output was :—

	Per cent.
Rhineland-Westphalia	42·5
Siegarland, Lahn and Hassen-Nassau ...	5·1
Silesia	5.2
Middle and East Germany ...	5·2
Bavaria	1·6
Saar Valley	7·1
Lorraine aud Luxembnrg	33·3

From this it will be seen that the separation of Lorraine, Luxemburg, and the Saar deprives Germany of about 40 per cent of her pig-iron production, and that Rhineland-Westphalia and the rest of Germany is brought under the present conditions in a large measure under economic dependence of the French supplies, more so as with shortage of sea freight and inland transport, import of Swedish and Spanish ores is difficult. Rate of exchange with these sources operates adversely to purchase in varying degrees, and prices are more largely affected by this factor at the present time than by costs of production in the separate countries.

MILD-STEEL IN 1913.

Turning now to the production of mild-steel the distribution was as follows for 1913 :—

	Tons.
Rhineland-Westphalia ...	10,112,042
Silesia	1,422,144
Siegerland, Hassen-Nassau ...	388,297
North-East and Middle Germany.	740,859
Saxony	331,125
South Germany	253,020
Saar Valley	2,079,825
Alsace-Lorraine	2,286,354
Luxemburg	1,336,263

This makes a total of 18,949,929 tons, of which Rhineland-Westphalia and the remainder of Germany was responsible for about 70 per cent.

The distribution of Bessemer converter and Siemens-Martin furnace capacity of the various districts will be of interest, and is as given below, from which it will be seen that Lorraine, Luxemburg, and the Saar represent about 20 per cent, and the remainder of Germany 80 per cent.

	Tons.
Rhineland-Westphalia, Lahn, Dill, North and Central Germany, and Saxony	13,640
Upper Silesia	2,310
Saar Basin	1,300
Alsace-Lorraine	1,450
Luxemburg	560

Germany's pig-iron production will prove just sufficient for the needs of her steel works, and as her shortage for foundries and other purposes will require to be made up by imports, a market might exist for British over-production.

SUMMARY OF GERMANY'S LOSSES AND PRESENT CAPACITY.

The capacities remaining to Germany in her present frontiers in the production of steel castings, and electro-steel, in girder, rail, section, hoop-iron, boiler plate, sheet iron, tin-plate, rolled wire and tube rolling mills, are greatly in excess of the output of the district over which she has lost control, but her dependency upon them for raw materials is very appreciable.

In Germany, as made up of Rhineland-Westphalia, Lahn and Dill districts, South Germany, including the Palatinate, North

and Central Germany, Saxony and Silesia, the number of companies engaged in the production of various steel products as compared with the Saar, Lorraine and Luxemburg is set out as follows :—

	Steel castings.	Electro-steel.	Puddle furnaces.
Germany ...	136	33	22
Saar	5	4	...
Alsace-Lorraine ...	3	2	1
Luxemburg ...	4	2	...

	Girder Mills.	Rail Mills.	Sections.	Hoop Iron.
Germany ...	26	26	64	31
Saar	4	5	5	3
Alsace-Lorraine ...	4	4	6	2
Luxemburg ...	4	3	4	2

	Boiler Plates.	Sheet Iron.	Tin Plate.	Wire Mills.	Steel Pipe.
Germany ...	40	67	5	33	27
Saar ...	2	5	1	4	3
Alsace-Lorraine,	2	2	1	2	...
Luxemburg ...	1	2	...	2	...

PRE-WAR EXPORTS.

Germany's exports of iron in 1913 found distribution as follows :—

	Tons.
Pig-iron	856,431
Scrap	196,401
Semi-products	700,779
Rolling-mill products ...	3,801,031
Other iron products ...	942,613
Total ...	6,497,262
Machines	594,317
Totalling ...	7,091,579

The total value of exported commodities was in the same year over 2 milliard marks, iron and steel goods accounting for 1·3 milliards, and machines about ¾ milliard marks.

Germany's exports of iron in 1913 found

	Tons.
Great Britain	1,208,000
Belgium	648,000
Holland	595,000
Brazil and Argentine ...	471,000
Switzerland	333,000
Austria-Hungary	331,000
China and Japan	304,000
Italy	290,000
France	216,000
British India	213,000
Denmark	171,000
Russia	160,000
Spain	61,000
United States	54,000

CONCLUSIONS.

With the loss of over 40 per cent of pig-iron, and 40 per cent of her mild-steel production, German industry is faced with a position, the results of which are difficult to estimate. As stated before, her impoverishment is nearly equal to the total amount of her previous exports, and it is well known that these were fostered in every way, and even to the disadvantage of the home market.

With a mercantile marine to be rebuilt, and reconstruction to be carried out within her own boundaries, it would appear that little surplus for export would exist, and such quantities as Germany is now throwing on the market are largely the result of the present boom and the huge prices obtainable by the local manufacturers when converted into mark currency at the ruling rates of exchange.

Little attempt, if any, has as yet been made to put her own works in order, and such of them as were subject to the severe stresses of war production continue to run in a state the efficiency of which would bear little comparison to pre-war standards.

POSSIBLE DEVELOPMENTS.

A very pertinent question which British interests should ask themselves is to whom will Germany's previous markets in rolling

Germany can at best only hope to keep them in part, and her power to do so is dependent upon the degree of co-operation she established with Sweden or France.

Should a Franco-Belgian-Luxemburg combination enter the field British interests will find the competition very keen, and though it is realised that any fear of competition from this source is precluded at present by the huge demand and shortage of supplies, it will behove British interests to look ahead. The race for export as a means of rectifying collapsed exchanges will be a serious one, and one more in the minds of our competitors than in our own whose economic position is less serious.

It would appear that some form of partnership or co-operation either with the French groups or with the German refining industry would be of mutual advantage. A way to the former lies in the supply of coal, and to the latter in the supply of pig-iron or semi-products, and coal.

As a result of the economic consequences of the war, the whole industry has become chaotic, and this is exemplified in the market fluctuations which take place from month to month, and the feverish but feeble attempts at price regulation. There is in practice no such thing as a fixed market quotation, and deliveries are uncertain to the most marked extent.

The pig-iron producing industry, previously supplied with Swedish ores at 11 to 13 marks per ton f.o.b. Swedish ports, now has to pay 38 to 40 kronen, and is thus called upon to deal with an exchange situation with which any serious manufacturer is powerless to compete. With freight standing at 450 marks from Swedish ports, the price of ore delivered at works runs out at 900-1,000 marks per ton, or sixty times that of pre-war prices. Foreign bills to meet these demands have up to the present had to be supplied by the producers, and have not tended to any stabilisation of the industry. Germany's debts to Sweden for previous imports have also had to contend with the difficult exchange situation, and the payment of interest alone on these have burdened producers with overhead charges, which as far as they are concerned, are without parallel.

Minette ores are to be had at present in very limited quantities, and chiefly in exchange for coal and coke.

The price fluctuations since the lifting of war control, and as compared with pre-war prices, have been abnormal, and have been due to the varied influences of exchange, shortage of coal and coke, shortage of ore, and critical transport situation.

There has been an insufficiency of semi-products to feed furnaces, and the demand for scrap has led to increases in prices in that commodity, from about 120 marks per ton in early 1919 to over 3,000 marks per ton in 1920.

An article which recently appeared in the *Taisho Nichi Nichi* shows some remarkable increases in the costs of Japanese cotton spinning companies. Comparing the two half-years of 1919, the rise shown during the second half-year for all companies is from 50 to 60 per cent. Investigations made by the Dai Nippon Boseki Company reveal that the company's expenses amounted to a monthly average of 1,650,000 yen from January to June, and of 2,500,000 yen from July to December, while the manufacturing costs of yarn of twenty counts rose from between 70 yen and 85 yen to 120 yen per bale of 400 lbs. For the first half of 1920 this figure is estimated at 160 yen. This increase in costs is due mainly to advances in wages.

THE MEANING AND VALUE OF NATURE STUDY.

By A. BURNETT-HURST,

Mistress of Method, Dioecan College, Calcutta.

BEFORE we can go into the educational value of Nature Study let us see what we mean by the term.

It could almost be summed up in the few words "Man's interest in the world about him," but, though it is this yet it is a great deal more than this.

Primitive man took an interest in the world about him but it was purely an interest to satisfy his material needs. With the advent of books that interest gradually died out because it could be dispensed with. But though the interest whereby man could further his own material needs was no longer in the real thing because books were available man's interest from an aesthetic point of view was still centred in the natural world around him, and he must be a very materialistic person indeed who takes no interest in nature.

We can *trace the development* of this interest in nature from primitive times. Man's first relationships were to animal and plant life and nature has played its part in the work of civilization. Man has had to work with nature—he has had to overcome nature. A time followed barbarism when man began to understand nature better and a new relationship sprung up. He found in animals his friends and companions—he began to tame and care for animals and it is to this no doubt that the instinctive love for animals which we see in the child, is due. We see this instinct in the passion for pets and this should give much scope for animal study.

As far as plant life is concerned man saw in it his means of subsistance but gradually his aesthetic sense developed and he could enjoy the beauty of the flower and as man developed he cultivated plants both because of their material value and their beauty. Through a study of plant life man has been able to differentiate between plants which are useful to him for his material wants and those which are welcome for their beauty and those which are poisonous and harmful—so man has learnt or should learn, to have in his home plants that are useful and beautiful.

Thus very briefly we have traced the gradual development of interest in nature. But when man takes a more than passing interest in the world around him—when he looks deep down into nature—when he begins to seek the reason why—when he notes the changes taking place around him then he has begun to *study nature*. So that Nature Study is something more than "Man's interest in the world about him"—it is deeper, wider, more awe-inspiring. Nature Study is by no means a new study if we go back to the time of Rousseau and Pestalozzi we can trace the development of the idea that man's education should be through things, not words, through interest in the world about him. Froebel very often gets the credit of being the originator or founder of Nature Study but the honour is rightly due to Pestalozzi. He lacked the learning and the initiative and the power of organization by which he might have made the study more organized and systematic—but the idea of it as an educational factor is undoubtedly due to him. Misunderstood and misapplied the study deteriorated into uneducational, uninteresting, isolated "object lessons."

Long before Pestalozzi's time however there began a struggle between the upholders of the classics and the upholders of the sciences—a struggle which is still going on—on the one hand we see those who advocate a study of man and his work, his language, his literature, his history, while the upholders of the Science School would have

education limited to a study of man and the world in which he is placed. We have only to look at the curricula of modern schools to-day, to see, as the school-boy would say "which side is winning." Perhaps while we seek the meaning of Nature Study we shall see why this is.

Nature Study may exist in many schools under different names—Object Lessons, Observation Lessons, Elementary Science, Nature Study—but provided the spirit in which it is done and the underlying principles are right the name does not much matter.

Nature Study expresses best what is meant as we shall see presently. Whereas the other terms may imply knowledge gained from books or facts expounded to a class Nature Study implies a direct *study* of *nature*. I referred a short while ago to the isolated object or nature lesson—this is often associated with Nature Study but if there is no sequence—no order—it may interest the class for a time but it is not a study of nature.

Let us analyse the term nature-study and deal with the first half—*nature*—obviously then it is not a book study. I do not say "no books"—the teacher may use her books to guide her and give her suggestions or to explain facts and a wise use of books may be very helpful but she must go to nature in the first instance—nature must be her chief guide and counsellor. Pupils in whom, through the work of a keen teacher, an enthusiasm has been stirred will want books in order to know more and if, by actual contact with nature we have awakened in our class that desire to know more, we have done a very great deal.

But, as I said before Nature Study must primarily be a study of Nature—nature under natural conditions where possible. We have sometimes to bring nature into the class room and in a large city like this this plan has to be resorted to often, but undoubtedly the ideal thing is to take the class to nature, let the children study plants and animals under their natural conditions—this can be continued in the school—we want the child to *see* things, to see them as they are. Nature is living, moving, developing—the old fashioned object lesson was as a rule artificial—dead—any model or picture accurate or otherwise served for a lesson. We want our class to feel that there are continual changes taking place in nature, that there is a history attached to the plant and animal life around us—that each has its own part to play in making that history—that there is an ordered and wonderful development taking place—what is more wonderful than the work of the ant—the development of the frog or butterfly—no isolated or occasional lesson can serve to bring out one iota of the wonder and mystery of it all—it is only by living continually with nature—by watching her ways can we feel the awe and wonder of it.

But Nature Study does not mean merely to enjoy nature—to see the beauty of it or feel the wonder of it—to read about it or talk about it. It is a definite ordered *study*.

We want to train our children to see the fundamental principles underlying nature and to understand these principles through the impressions they receive—the observations they make—they must find a reason for what they observe—they must *think*—they must endeavour to answer the questions "how" and "why."

Again nature must be studied in its relations so that the child will see the mutual dependence and interaction that exists in nature—we cannot take up a flower without realizing its relation to the weather and soil—to the insect that fertilizes it—to man and to other plants and flowers. It is for this reason, too, that we cannot expect to study nature by means of isolated lessons. We must endeavour to let the child see a connection between every piece of work in nature which he undertakes and *studies*. Let us take some examples—suppose we

study a particular flower—the sweet pea, for instance—to really study it we need to bring out its relation to its environment—the soil in which it grows, the need it has for air and water, and this will lead our class to see how the plant is adapted to receive such food and water—structure and function—the class will see that without food, water, light and air the plant could not live so that it is *dependent* upon these.

Again we cannot study the part of a plant, *i.e.*, its flower and leaf without studying the whole plant to which it belongs—thus the child sees how the part is dependent on the whole and *vice versa*—here again we see structure for function—the function of the leaf, the stem, the flower for the benefit of the whole plant and the structure of these in order to carry out the function.

Then again there is the relationship between the plant and the *animal*—it is, for example, essential to the sweet pea that the bee should visit it—it is likewise essential that the pea should have food.

Relationship to *man* is shown in the fact that plant life as well as animal life help to satisfy his material needs and contribute towards his aesthetic needs—inspiring the poet, the writer and the artist.

The relationship of Nature Study to *school work* is indeed close—only those who have carried it out in the proper spirit have realized what an incentive to other work the nature work is—it tends to stimulate interest—it gives the class an added pleasure in school life—it supplies material for many of the occupations and it is also a very valuable aid in other subjects.

Above all it brings the child closer than anything else can, to his *Creator*—he sees in the flower and in the wonder of animal life the power and goodness of the Creator; he sees, as Froebel says that "In all things there lives and reigns an eternal law... ..All things have come from the Divine Unity from God, and have their origin in the

And now we come to the *value* of Nature Study.

The child's early life is lived with nature—he receives all his education from the impressions made upon his senses by the things around him—he learns through seeing and through doing. It is nature's way of educating the child, through a knowledge of his surroundings. If it is nature's way it surely is the right way, yet those who are responsible for the education of the child more often than not put an end to this method of education—no sooner the child enters the school instead of allowing him to gain further sense impressions and supplying material for this we begin to cram him with our ideas just as we endeavour to hinder his self-activity—the very means which nature has supplied whereby the child may grow and develop.

Nature study then helps the child to continue his education as it began—it gives material for the exercise and use of his senses, for his self-activity and love of doing. It supplies food for the natural instincts which are present in every normal child *viz.* imagination, love, reverence.

It is instinctive for the child to imagine—for him to wish to do things—but it is not instinctive for him to observe—that comes with training and nature study is valuable because it is a means of training the observation. It is a power that must be trained and developed—the eye of the botanist or zoologist is far keener than the eye of an ordinary individual. Nature students see far more in nature than those who take no interest in nature. But we want to develop the right kind of observation—the observation that sees beauty and wonder in everything, not the observation that seeks the mean sordid things of life.

We are continually brought face to face with the question "is it right to make all learning interesting?" Now is it right that there should be attention on the part of the

"yes" then you have interest for you cannot separate interest and attention; any one with an elementary knowledge of psychology knows how very closely these two factors are connected. Any attention that is not accompanied by interest is forced and besides being of little value cannot last. If you have interest you have the right kind of attention; therefore every teacher is keen on interesting her class. The knowledge the pupils gain will be in proportion to the interest we succeed in arousing the senses respond to interest—when we are interested we listen—we look—we touch. Have you ever watched the deeply interested child, if it is some story he is interested in it,his whole body takes up a listening attitude, his eyes are fixed on the story teller, the rest of the world a thing apart. If it is some object in which he is interested he turns it about, feels it, smells it, may be, tastes it. Every sense comes to the help of his interest. No nature study is worth undertaking in which the child is not interested.

To go back to the question of instinct, curiosity we know is an instinct present in a greater or less degree in every child. We all know the typical child who peeps into everything, who wants to know the 'why' and wherefore of all he sees. Untrained or wrongly trained this instinct may deteriorate into that disagreeable inquisitiveness so common in some children and so undesirable. Well trained it will develop into that desire to know more which will help him throughout his school life and after and will be a blessing to those who have the responsibility of his education. Nature Study gives us an excellent means of training this instinctive curicusity, the child will always make use of any material that supplies him with a means of satisfying his curiousity. Specimens, pictures, all help to awaken his curiosity, create interest, and arrest attention. By turning to good account the child's natural curiosity we will aviod boredom, laziness, and worse.

Having dealt thus briefly with the development and training of the earlier instincts of the child let us see if Nature Study assists us with older children though the values just mentioned will still be present and must not be overlooked.

Nature Study gives endless opportunity for aesthetic training. The School Nature Study Union in London has for its motto "To see and admire, not harm and destroy." One of the values of the story in the kindergarten and of literature in the school is in the joy it gives. To give joy should be the aim of most school work. It certainly should be of Nature Study. The joy it gives is one of the factors that makes it so valuable. The child gets untold joy in dealing with actual objects in seeing, feeling, etc. The child derives enjoyment in seeing living moving objects and in doing things for himself, in sowing seeds, tending his pets, making discoveries. But the real enjoyment is in the pleasure that the beauty and wonder and mystery of the object reveal, beauty in the ordinary commonplace things of life, this alone will create a love for and interest in Nature Study. There is joy in the contact with and observation of Nature. Let your pupil feel the wonder of the smallest thing; if we can do this we will not hear such remarks as "Oh, we have done trees" or "We know all about the snail." The attitude of the teacher should be the attitude expressed by Tennyson when he said:—

"Flower in the crannied wall,
I pluck you out of the crannies,
I hold you here, root and all, in my hand,
Little flower-but if I could understand
What you are, root and all, and all in all,
I should know what God and man is."

We will get this attitude to a certain extent if we let the child see the relationship of parts to wholes, *e.g.*, the child will see the wonder of nature more clearly if he realizes the wonderful way in which the seed is fertilized, how insect and flower work together,

and then how nature provides for the dispersal of that same fertilized seed. Nature Study should be an incentive to us to make our homes and cities beautiful and arouse in the children a desire to preserve the beauties of nature by the cultivation of flowers, by gardens and by flower shows.

They should be able to appreciate the beauty of their environment or endeavour to make it beautiful. Aesthetic training does not only mean seeing beauty in form, in colour, in structure, in function, in adaptation, but a deeper beauty still—the beauty that the poet and artist see. The artist and the poet have been inspired by nature and it is our duty through nature to get the child to appreciate the productions of the artist and the poet.

Let the child enjoy the beautiful thoughts others have culled from nature. We may talk about clouds, their formation, their use, even their beauty of form and colouring, but how much more do we get out of.—*The Cloud*, by Shelley). I have touched on sense-training and aesthetic training but nature study also gives mental training, provided we attach the right meaning to mental training. Book study has occupied and still occupies far too much of our school time. One of Herbarts abiding principles is that all knowledge is assimilated according to the idea with which it is associated in the mind, now we are well aware that not only with children but with adults the strongest associations are those which have been gained through spontaneous self-activity; therefore we must select that which is closely related to the child's life and, as I have just pointed out, it is the living, moving developing world around him that is so near and dear to him. We want to form in the pupils minds an interest worth having—a deepa biding interest and we can do this by giving him opportunities of connecting all the new ideas we wish him to gain, with those in which he already has an interest so that all his school work can be closely connected with his nature work.

We do not want to cram him with facts but we want his mind to develop just as his body develops naturally. Nature Study is not "baby work" it is disciplinary; it requires just as much thought and judgment as mathematics. We cannot develop the intellect through supplying our pupils with a mere storehouse of facts, this may train the memory but we want to do something more than that; hence we want to keep books in the back-ground only by letting our pupils become little discoverers, finding out and reasoning out facts for themselves, and expressing them can we give valuable mental training. Thus we help to develop *Power*; power to think, power to judge, power to express. The school has always worked far too much apart from the Home. Home and School should be in closest unison; this is best done by Nature Study. Nature Study should not end with the days school work. It requires investigation and research and this will lead the child to continue his study in the home and in his walks with his parents he may interest them in the wonders of nature.

In these very practical days no doubt the question arises as to whether there is any practical value in nature study. We never mean that the school should be the training ground for a man's life work, though it might prepare hin, nor does it aim at a technical education that is left to the technical school but nature study gives the pupils an insight into the ways by which man adapts himself to his surroundings and the means he uses to overcome his difficulties; it forms the bases, too, of much technical work, drawing, designing, gardening, etc.

But what we need most in our schools to-day is sympathy—perfect sympathy between teacher and children—all the nature study in the world is useless, worse than useless without this. Interest, observation, knowledge, power, love of the beautiful—all have their place in nature study, but above and beyond all this we must have sympathy.

love. We need to develop in our children a deep and abiding love for nature and we shall only do this in proportion as we are in love with nature. All the other values desirable as they are without love and sympathy will lead to wanton destruction—flowers pulled, birds' nests robbed in the desire to obtain material. Better leave Nature Study severely alone than to just start these desires in the child without accompanying it with the love that would not think of hurting a bird or deliberately breaking up a flower. By giving our children animals and plants to care for, we can engender a good deal of love and sympathy but we must be in sympathy with them and with our work. "We needs must love the highest when we see it" and surely we see the highest in nature. There we get the most valuable of all values—to get the child to see in nature an eternal law to see his Creator in nature—

"Each little flower that opens,
Each little bird that sings,
He made their glowing colours,
He made their tiny wings,"

The following circular has been received from the Consul—General for Norway at Calcutta:—An Industrial Fair will be held in Christiania, Norway, from 5th to 12th September next. It has a special interest to foreign buyers who may desire to take advantage of the present occasion as likely to facilitate the formation of connections between them and Norwegian producers and exporters. Such buyers are requested to apply in time to the Trade Intelligence Bureau of Norway, Christiania. The principal lines of Norwegian manufactures and articles of export may be ascertained on application to the Acting Consul General for Norway, 3 Chowringhee Mansions, Calcutta.

PLEA FOR PAPER MILLS IN MYSORE.

By L. S. Subrahmanya Aiyar, B.A.,

Chemist, Late Special Forest Office, Mysore.

IN his presidential address before the Economic Conference held recently, Sirdar M. Kantaraj Urs, made the following remarks with regard to large industries:—

"Though there is great scope for such large industries as cotton, silk, *paper*, woollen and oil mills, sugar factories, manufacture of leather, essential oils, medical preparations, etc., and the State has much mineral wealth, water and other sources of cheap power supply, it has failed to take the lead given to it by its abundant material resources."

"Owing to the construction of a large length of tramways in connection with the iron scheme, special facilities will be provided for cheapening the transport of materials required for the manufacture of paper-pulp. The exertions of Government officers will be in vain, unless private enterprise comes forward to take advantage of these opportunities, and start Joint-stock companies on a sufficiently large scale to deal with these industries."

These are words of advice, sympathy and encouragement, to capitalists and industrialists. The Mysore Government's solicitude for the welfare of the people and the advancement of the country has always been exemplary. The interests of the capitalists will also be guarded by them with sympathy.

In spite of the facilities thus afforded by the Government and the wealth of raw-material and fuel in our forests, cheap power and abundant natural resourses, Mysore does not yet possess a paper mill. But with fewer facilities, a paper mill has been started in Madras with an authorized capital of

Rs. 10,00,000. The mill is proposed to be located at or near Madras, with subsidiary pulp mills at centres of raw-material. Though it is surprising to see that, in spite of the elaborate investigations conducted in Mysore regarding the establishment of Bamboo pulp mills, Madras has taken the lead over Mysore. So long as there is room and need for several more mills in India, it is hoped that Mysore will not lag behind. Even now it is not too late for local capitalists to think of floating a company for the purpose of exploiting the bamboo for paper-pulp.

It is my purpose in this article to discuss the questions of the site for a paper mill, the raw-materials available in the State for the manufacture of paper-pulp, and the chemicals, etc., needed and how to procure them, and finally to appeal to Mysoreans generally to take up the question of establishing a paper mill in Mysore in right earnest.

Site for Paper Mill.

The best plan to adopt in the matter of locating a paper mill is to have a Central Mill for the manufacture of paper at Mysore or Bangalore, with feeder pulp-mills distributed at four or five places near the source of raw material and fuel. Sound commercial keenness would recommend the same proposal as it is consistent with economy and efficiency.

The pulp mills can be started for example, at Benkipur, Nanjangud, Kankanhalli and such other places, having a suitable supply of raw-material, fuel and water. If Mysore or Bangalore cannot be accepted for the Central Mill on account of high cost of labour or want of good sites, any suitable place near to railway and electric power transmission lines may be chosen.

Mill Machinery and Plant.

The needs of pulp mills are a few machinery which can be made or procured within India. A crusher designed to crush bamboo, a straw chopper, a boiler to supply steam for power as well as digestions, two or three digesters of large capacity to cook the raw-materials, a few beaters or edge-runner mills and a baling or hydraulic press. With these, the raw material may be digested, washed, ground, dried, packed and sent to the central mill. By adopting this method, the cost of freight is reduced to a minimum.

Intelligent mechanics should be able to run and manage such mills with the help and advice now and then, of an itinerant paper mill chemist, attached at other times to the central mill.

The central mill must possess all the machinery and plant required for an up-to-date paper mill, which must of necessity be imported. In addition to these there must be a complete set of experimental plant and a well equipped laboratory to conduct investigation on new raw materials and solving problems arising out of the routine work of the mill.

Raw Materials.

Having fixed the site or sites for the mills the next step is the choice of raw materials and their supply. We have in our State a number of such materials suitable for paper. A classified list and description of those available is given below to facilitate choice:—

(1) Rags and other textile wastes, and Waste paper.

These materials need no introduction, as they have been used from time immemorial, for the manufacture of paper, clean and better grades of rags find use in the manufacture of high class papers as bank notes, currency notes, etc. They always come in very handy to the papermaker, as they require no drastic preliminary treatment that bamboo, for example, should be subjected to.

(2) Old ropes, gunnies and fibrous waste of fibre industries. In Mysore the quantity of these materials available may be small. But whatever quantities are available, may be collected and used with advantage.

(3) *Bamboo*.—Bamboo belongs to the same botanical order as straws and bears a close relationship to the stems of the *gramineæ*. The microscopical features of the bamboo are similar to those of straw, as also the chemical composition. Hence it is said that bamboo stem "may be broadly characterised as a gigantic straw."

Ever since Routledge set on the investigation of bamboo as a paper making material, bamboo has attracted the attention of the world. Subsequently the investigation of experts like Messrs. Sindall, Railt and Pearson, have established beyond doubt, the suitability of bamboo for paper. My own humble experience in this line has shown, that even *hebbidaru*, a tough and thick-walled variety, can be worked up for pulp, especially when treated green. The chief difficulties at first encountered were the disposal of the nodes and the thick walls which resisted penetration of the caustic eye and difficult bleaching. But now the necessity to isolate the nodes is done with, and a system of fractional digestion is evolved which facilitates penetration of the eye and final bleaching.

Most of the varieties of bamboos available in the State are useful for paper. We have ourselves tested five varieties, of which *hebbidaru* and *kiribidaru* are available in very large quantities. The variety known as *Ochlandra travancoriea* has struckers as the best suitable, if available in large quantities. It is more easily treated for pulp than *hebbidaru* (*Bambusa arundinacea*) and possesses fine silky fibres which produce good white paper. It seems, this variety being available in enough quantities, is used in the Punalur paper mills, in Travancore.

The bamboo in general yields strong and flexible fibres, possessing good felting properties.

(4) *Straws and grasses*.—Of straws we have only paddy straw in our State which is rather inferior to wheat, rye, barley and oat straws. But yet it is quite suitable for boards and paper, as our own experiments have proved. The evidence of greater authority is also in its favour. Samples of Egyptian rice straw were sent to the Imperial Institute, London, and their investigation showed that the straw when treated by the soda process yielded pulp of good quality suitable for the manufacture of white paper and that treated by soda or lime process, rice straw also serves for the production of straw-boards and brown paper. "The results obtained confirmed those already recorded in the United States."

As for grasses we have a number of varieties useful for paper making. In northern India the existing paper mills have been using grasses like ullagrass, munj, sabai grass, etc., for making paper. Some of the grasses of our forests, *e.g. Doddahanchihullu* (*Anthisteria imberbis,*) *moodehullu* (*Anthisteria cymbarica*), *sole hullu*, etc., have been tested by us and found suitable. The same has been said by authorities on the subject, who conducted experiments on these, on behalf of the Government of Mysore.

In our forest grasses we have a plentiful supply of raw materials for making paper. They are at once easy to collect and treat, converted as they are to pulp more easily than bamboo, it will be advisible from the economical point of view to use them liberally.

(5) *Sugar-cane megasse*.—Mysore State has not been till now an extensive grower of sugar-cane. But in view of the fact that vigorous steps are taken by the Government to encourage cane growing under the Marikanve and

Krishnarajasagara lakes, we may at some future date be faced with the problem of disposing of waste megasse.

Sugar-cane like bamboo belongs to the same order as straw, its microscopical features being similar to those of straws. The large percentage of pithy matter in it seems to disqualify it as a material for paper. But yet it is encouraging to see what is done in Hawaii. I quote from an expert's report :—

"It is a fibrous substance and lends itself to making paper-pulp. Admirable papers of many sorts have been made by its fibre by ourselves and others. These, however, tend to be hard and tinny; whereas our problem was to produce a pulp, from begasse that would make a sheet which, under proper treatment, is strong enough to withstand the Hawaiian rainfal and yet give way under constant gentle pressure rather than by a punch."

This was to kill the unwelcome weeds and allow only the cane shoot to grow, piercing its way through the paper sheet. The experiments are reported to be successful and as reported in the *Paper Maker's Monthly Journal* of February, 1919, a project was launched to erect a megasse-paper-mill, at Olaa, Hawaii, capable of manufacturing 16½ tons of paper a day. "Its purpose primarily will be to produce the heavy mulching paper experimentally adopted in Olaa last year (1918) as a means of preventing the growth of weeds in the early stage of the Sugar-cane crop."

It is seen from this that megasse is quite suitable for making of paper, even of special qualities.

(6) *Bast fibres.*—Under this class come flax, hemp, jute, sunnhemp, china-grass, etc. In Mysore we grow only hemp, which is neither extensive nor systematic, and as such the paper industry cannot expect any supply of raw material from this source.

(7) *Fibres from leaf sheaths.*—Such as from aloe, agave or sisal hemp, and plantain stems, etc. These give fibres quite suitable for paper pulp. But as their fibres are valuable for textile purposes and the paper industry can expect to have only the waste fibres stuff, it is not worth while to consider the question of their collection. Further a good supply cannot be had, as these plants are not grown extensively in the State.

(8) *Miscellaneous raw-materials.*—I had an opportunity to test such materials as lantana, cotton-stalks, *jambu grass* (a kind of reed), arecanut husks, etc., which were found to be suitable for at least brown paper and boards. The ultimate fibres of some of these, especially of lantana, are short and lack flexibility and strength and their pulps are difficult to bleach. These may be considered to be "desperate remedies" like saw dust, spent tan-barks, wastewood, dead leaves of deciduous trees, which sprung up to prominance in England and France, during the War. But amidst our plentiful supply of more suitable raw-materials, we need not now turn our attention to these. Yet in view of the fact that lantana has been a destructive pest, it is of interest to note that our results are confirmed by the results of experiments conducted in Australia. Of the various raw materials tried for paper in Queensland, it has been reported that lantana, gives a fairly strong brown paper "with a tearing strength of 20 to 25."

CHEMICALS.

The next step in the progress of the industry is the supply of the chemicals needed for the mill. The chemicals required are caustic soda, soda ash lime, bleaching powder or elecrolytic bleach liquor, rosin, alum, gelatin, starch, china clay (kaolin), talc, and ochres or coloured earths.

(*a*) *Soda and Lime.*—The first process after reducing the raw-material into small chips or cuttings, is to digest them with chemicals in order to isolate the fibrous material termed cellulose, or eliminate the non-cellulose matter, which binds the fibres together. The non-cellulose matter, may consist of lignose, pectose, resinous or fatty matter, which are attacked and dissolved away by the chemicals, on boiling with them, under pressure.

For manufacturing wood pulp, sulphate and sulphate processes are employed. But for our purposes here, soda and lime processes will do.

Of the chemicals used for cooking, *viz.*, caustic soda, soda ash and lime, we have in our State only lime, and that too not of the best quality. The other two will have to be imported from outside. Sodium carbonate samples prepared by the Mysore Geological Department and private agencies from efflorscent earths, are quite good for the purposes of a paper mill. Caustic soda can easily be prepared from the crude carbonates, by causticising the latter with milk of lime. Only the mill will have to possess a causticisor. The supplies from the different earth soda producing centres, if efficiently worked, may be enough for a moderate mill.

(*b*) *Bleach chemicals.*—After undergoing chemical boiling the material is called the "half stuff," which has to be washed, bleached and ground up for pulp. It is customary to use for bleaching purposes either bleaching powder or electrolytic bleach liquor (sodium hypochlorite).

Bleaching powder is a substance which does not keep long in hot countries, and its manufacture requires cold temperatures. Hence for the manufacture of this chemical on a large scale, a cool climate is needed, which does not obtain in our country, except in places of high altitude during winter. A refrigerating room might be erected: but it will be expensive. Thus India has been a helpless importer of this material from foreign countries and she imports enormous quantities for her cotton and paper mills.

But we in Mysore are not justified in importing bleaching powder, when we can prepare our own electrolytic bleach liquor by electrolysing lime. We possess cheap electric power and common salt can be bad cheap for industrial purposes. Further one of the ways of getting chlorine in manufacturing bleaching powder is by electrolysis of sodium chloride (salt).

Even in Europe for the last ten years, this electrolytic bleach has been preferred to bleaching powder in cotton and paper mills. Hence by erecting an electrolytic bleach plant at the central mill, dependence on outside supply is avoided and any amount of fresh bleach liquor can be made at the mill.

(*c*) *Loading materials.*—Loading, sizing and colouring come next and are performed while the half stuff is undergoing disintegration to pulp in the beater. It is only when the paper is subjected to tub-sizing with gelatin that the operation is performed on the finished paper.

"The process of loading consists in adding a mineral clay to the pulp for the purpose of filling up the interstices or spaces between the fibres. Its functions comprise the compacting of the sheets, the production of a

pleasant mellow finish, smoothness and uniformity of surface, and the introduction of opacity and a degree of absorption requisite for the proper acceptance and drying of printing ink." Materials chiefly used are china clay, calcium sulphate, barytes (barium sulphate), talc, etc. Of these we get within the State kaolin and talc the suitability of which must be first tested before importing them. Most of the paper mills in India have been importing clays from abroad, under the impression that the local clays are not as good as the imported stuffs. But we get within our country soft, clean and tenacious clays which should be quite suitable for loading paper and should be given fair trial.

Calcium sulphate and barium sulphate are generally used for high class printings, chromo and art papers. They are either prepared by precipitating, or grinding pure mineral naturally occurring. These will have to be imported if high grade papers are contemplated to be manufactured.

Talc imparts a high finish to the paper and as such it is recommended as a loading material. This is also obtainable in our State.

(d) *Sizing materials.*—The materials generally used in sizing paper are rosin soap, gelatine size, starch and casein size. Of these rosin soap is the most common. Rosin was being imported to India from abroad; but in recent times a local source of supply has arisen from the Government Turpentine distillaries at Kumaun, and so India has not so much to depend upon imported rosin now. It is hoped that soon the whole of the country's demand will be met with by them.

We here in Mysore have any way to get our supplies from outside the State, unless vigorous steps are taken to investigate the local sources of rosin and their utility. Alum or Aluminium sulphate is also used in conjunction with rosin soap to deposit on the fibres free rosin and aluminium resinate which act as cohesive and water proof materials. We have to import these also.

"Sizing treatment is mainly carried out with the object of imparting cohesion of the fibres, neutralising the tendency towards capillary attraction of the fibre tubes, and inducing ink resistance in requisite degree." Sizing gives strength and durability to the sheets of paper and render them proof against direct absorption of ink.

Gelatine size is generally used for high class printing paper. Gelatine and starch are substances which can be easily manufactured at the mill itself. Gelatine is prepared from hides, rejects and refuse from tanneries, and shoe-makers wastes. These materials we have enough in our country, if only efforts are made to collect them.

(e) *Dyes and Colours.*—Colours and dyes are used for what is called technically "rectifying whiteness" and for making coloured paper. Superior blues and pinks are used for the former purpose. Dyes and colours are classified under two heads, organic and inorganic, and these again classed into subjective and objective. Objective colours require the aid of a mordant to impart their colours to the fibres. Here in Mysore, we have to import all the colours and dyes from outside except perhaps a few ochres and red earth pigments, that may be used for cheap coloured papers, and hence we need not expatiate on the subject here.

I have thus briefly showed how most of the requirements of a paper mill can be met with from the resources of the State, which will go a great way to minimise the cost of production and thus leave a fair margin of profit for the capitalists. It is accepted on all hands that there is need for one or more

mills in the State and that the State can provide room and facilities for even half a dozen of them. While the industrial outlook outside the State is rapidly changing, and money is freely flowing into the channels of industrial activity, that capitalists in Mysore should feel diffident and shy is inexplicable.

That there is money in the paper industry, I am fully convinced. And I desire to press the point on our local capitalists. It is an industry which is bound to thrive with the spread of education and the advance of civilization.

The number of companies started in Mysore and the capital invested in them, is nothing when compared with the All India figures. In 1919-20, between April 1919 and March 1920, 906 companies were registered in British India with an authorised capital of Rs. 27,470 lakhs, with an average authorised capital of 30·3 lakhs per company; and since April 1920, a great many more have been started. By the side of these figures, what the figures are for Mysore is a matter for reflection and serious thought.

The Government of Mysore may be approached for necessary concessions, which it is needless to add they will view sympathetically. The State has the facilities of raw-material, cheap power, railway and forest tram communications, and above all industrialists have in the Mysore Government, genuine sympathisers with their aims and objects. May I appeal to our local industrialists and capitalists to come forward to float a company for starting a paper mill without further delay?

With reference to the Trade enquiries between the Bureau of Commercial Information, Bangalore and The Anglo-Egyptian Trading Company of Manchester and also the Batra's Agency of Lahore, such of the local dealers and merchants who are desirous of undertaking Agency business are requested to apply to this Bureau for the necessary particulars, etc.

AID FOR RELEASED PRISONERS.*

I

By The Inspector-General of Prisons, Madras.

The Calcutta Prisoners' Aid Society was founded in 1907; the Bombay Presidency Released Prisoners' Aid Society was started in 1914. Will it be in 1921—after another spell of seven years—that Madras follows example? It is a good example, so let us hope. Time is moving on, and it is highly probable that a public meeting to consider the matter will be held in Madras in the coming cold weather. A beginning has already been made. The press, ever ready to push a good cause, has been at work, and the idea is being spread by gentlemen who have the general welfare of society at heart. The Madras Social Service League has welcomed the idea and promised its assistance.

Probably the general mass of the population of the Presidency has never troubled itself to enquire into the position and prospects of a man who has been a prisoner. The Madras Government as a fact pays the man's way home and, if needed, grants a subsistence allowance to cover maintenance for one month to convicts released after 12 months' imprisonment. Obviously it cannot continue to support the man longer—without raising more taxation or without being cheated, as it cannot keep an eye on the men released to see if they honestly try to gain their own livelihood. The further help of a released prisoner is a proper object for that greatest of Divine inspirations, charity. Like mercy, it blesses him that gives and him that takes.

First we may analyse the word 'Prisoner.' We are all, more or less, offenders against the moral law—the law which all religious and social reformers have laid down for men

*Issued by the Madras Publicity Bureau.

to obey. The law has drawn a line through the list of moral offences and has ordered that persons who commit an offence which stands above that line shall go to prison, but it leaves those who do an offence which stands below the line to the punishment of their parents, priests, caste-fellows, or consciences.

If the law liked to put lying or back-biting, in the upper category, how few of us would avoid imprisonment? If the law forbade men to make profit out of speculation or to take any unearned increment, many a man of ease and repute would now be wearing His Majesty's Dungaree uniform.

Most of us are kept back from committing the more serious offences by our home or school training, our wealth or our religion. Most prisoners are men who have never been blessed with these amenities of life.

You may become a temporary guest of His Majesty either from a fault in your nature, or by a fault in your environment. The sinner-by-nature is a hard case which doctors and specialists will have to deal with. The sinner-by-environment is the gentleman that we are out to help. Only consider the environment of many of our fine cities. Probably only the padre or the district visitor can gauge its depths. If you lived in the poverty and squalor of the slums, with no healthy recreation to look forward to every evening and with despair as to how to find the morrow's food for your family and yourself—is it not probable that you would take to practices on which the law frowns? And the atmosphere in which you spent year after year of your miserable life would very soon permeate your mind and work in you a second nature which would deaden you to all the better influences of life.

Society in its growth has—unconsciously perhaps—created these slums and this nursery of crime. It is up to society to play the game and wash out its own sins.

Then there is 'Aid.' What is that? It is not just giving the released a rupee and then a kick. It is the immediate provision of food and shelter to the man and more important still, the hand of friendship and sympathy. Then there is the effort to reclaim habituals and to fight hard against all the accumulated obstructions to healthy homes and surroundings, so that the seeds of evil may find it better to quit. There is the organization of methods of curing in time the casual or young offender. Schools of instruction to teach men trades—a work begun in the jails but often not completed by the time of discharge—would come within the programme. And there is the man's sustenance while he is starting new work, and perhaps the outlay of some capital for him, under supervision. In South Africa, the society keeps an eye on the prisoner's wife and children while he is locked up. This last charity needs no comment; it commends itself.

The man of Ease and Self will perhaps ask how he will himself benefit by supporting any such society. The answer may be found in the reports of those societies which have been long at work.

There are hundreds of released prisoners who do not need aid. They have their old jobs to return to or have relatives who can give them work or maintenance. On the other hand, there is a very considerable number who, if not assisted, will revert to questionable ways and remain a constant source of Government expenditure and of taxation. Mr. William Tallack writes in 'Penological and Preventive principles':—'The various efforts put forth of late years, in Great Britain, for the aid of discharged prisoners, have materially contributed to reduce the number of criminals. But like most other forms of beneficence, this good work is sometimes...... made a subject of censure by ignorant persons who raise the objection that when all the needs of honest poor men are provided for, then it will be the proper time to help the rogues, but not before. Now......it may

be noticed that the people who raise these objections are generally such as never bestir themselves to help others.........and......... discharged prisoners are a class who absolutely require aid, on grounds both of mercy to themselves and of the self-interest of the community.' Criminals cost the community many hundreds of thousands of pounds. 'The reformation of a prisoner.........is one of the cheapest developments of social wisdom.'

Then there is the point of the society which will carry out the aid. Government cannot do it alone without raising fresh taxation, and Government work has to be run on the system of a machine rather than that of a man. It is the spirit of friendship that can do the work best. It is the man who will work for the love—not for the pay—of the thing that is needed. It is no good taking a plough to break a rock. You must use a crowbar. And there are hundreds of men of good intent who would rise to the occasion. When the war began, hundreds of old men rose to the call, and after a little training found themselves to be as fit for active service as the youngsters. Many a middle aged man or old fogey who is mouldering away and useless for want of a serious job in life might well take up an active part in the coming society and find his youth and vigour restored, and his soul becoming white by a new, though belated, interest in the more unfortunate members of the community. And the work will be wide and there will be plenty of scope for the activities of all who volunteer. All religions commend charity. It is a physical fact that charity develops a man's soul and makes him fitter for the hereafter. Not blind, indiscriminate, weak, simpering charity. But solid, thought-out, and reasonable charity. And the society that is to be, gives men of good intent a very good opportunity of rubbing the rust off that excellent ornament of their souls.

It is the non-official human being that can make the proposed society a success. It is the non-official being that has brought the co-operative societies to so real and useful a state. The latter, however, has the impulse of self-interest to nerve his venture. The former will have as his inspiration a more altruistic motive which will make him the better man of the two.

The future must decide how far Government will contribute men, material and money. Our present object is to set the non-official thinking, talking, and preparing. His Excellency the Governor in Council desires to see the ground being thus prepared, and when the views of the Indian Jails Committee are known, the way will be open for the organization of the proposed society.

In a second paper, some details of the organization, aims and working of some of the existing societies will be laid before the public.

II

A few details from the report of the Commissioners of Prisons and the Directors of Convict Prisons (England and Wales) for 1913 may be of use, though the large number of charitable organizations and the number of clergy and visitors in England make relief more readily available than is yet the case in India.

In 1913, sixty D.P.A. societies sent in their reports to Government. Nearly £20,000 were subscribed locally, and Government added some £3,500 which would have been more, had more societies claimed what they had a right to claim. Money was spent on direct relief to prisoners, grants to homes, rent of premises, agents' salaries, etc., and these amounted to some £20,500.

There were 202,000 persons discharged, of whom the societies aided 42,000, and of this number no less than 7,500 are reported as doing well. Many More would be recorded if it had been possible to keep in touch with all the aided. And many released prisoners were taken charge of by the Church Army, the Salvation Army and other charitable societies.

The Calcutta Prisoners' Aid Society was founded in 1907 by Sir Harry Stephen. Its report for the year 1918-19 shows a list of 41 members. During the year, 151 persons were aided to the amount of Rs. 690. Shelter, food, clothing and work are provided for those who need them, the object kept in view being to dissuade them from reverting to crime. Not a few were aided to their homes in the mufassal. The society runs a workshop in which the ex-prisoners can earn wages, and the average wages received by them varied from Rs. 32 for a first-class workman down to Rs. 16 for a fourth-class one. The workshop machinery was in the first case old machinery given by Government.

In the Bombay Presidency Released Prisoners' Aid Society, members who pay Rs. 1,000 become patrons; those who pay Rs. 200 become life-members. Others pay Rs. 5 a year. The society is managed by a Central Committee of 12 to 24 members including the Inspector-General of Prisons, the Inspector-General of Police and the Commissioner of Police, Bombay. Government appoints one member and the rest are elected by the members. Ladies are eligible. There is an annual election.

The Central Committee can appoint district committees consisting of subscribers to carry on work in the districts. The Chief Revenue, Judicial and Police officers and the Superintendent of the District Prison are ex-officio members of these district committees.

The Central Committee can purchase, lease and hold lands, buildings and other property for the purposes of the society, and must make an annual report with statement of accounts.

The third annual report of this society—that for 1918—shows good and increasing work done. N. M. Wadia Charities contributed Rs. 1,500, the W. I. Turf Club, Rs. 1,000; donations for patronage and life ...ship came to Rs. 4,401, the Account- ... butions came to Rs. 770. Payments include —Relief to prisoners released, Rs. 1,552. Agent and peons' salaries Rs. 776. Rent and petty expenses, Rs. 180.

The work done included jail visiting daily by the Agent Mr. M. R. Chitnis. Two other gentlemen gave weekly lectures in two jails. Five hundred and twenty-seven released prisoners received aid. This aid consisted of the finding of employment, temporary board and lodging, restarting the men in previous trades, assistance to get home, and in some cases clothing. Regular employment was secured for 85. Seventy-nine were helped with tools and materials to re-start old work. Three hundred and fifty-one received food, and 50 received clothing, and 56 temporary lodging.

It is difficult to keep in touch with aided prisoners after their release, but Mr. Chitnis visited a large percentage of those who had found regular employment through the society.

Besides these two societies in Calcutta and Bombay a local society has been set on foot in Bellary, which has thus set a gooc example which the Presidency would do wel to cogitate over and act upon. The societ was organized in 1917 by Rao Bahadur C.S Subramanyam, a non-official visitor of th local jail, and is supported entirely by loc non-officials.

The scheme which is at present in mind to establish first a large Central society Madras itself, and then to get local bran societies going. The analogy of a hen and l chickens is not inapt, for the chickens mi well hope to get a share of the food which hen scratches up. And above all it is desired to have parochial jealousies arou The societies are not to be started for bonour and glory of individual districts, for the good of the humanity of the Ma Presidency. If they were to stand a they might fail for want of sustenan from a falling off in original vigour

which they would be inaugurated. Local Co-operative Societies found that they were unsteady without a central organization which was ready to provide them with a solid backing.

Government will shortly give a lead. In the meantime, it is hoped that the facts that have been published may set men of good-will and also men whose balance sheet errs on the side of credit, thinking if they will or will not 'fall in' as soon as the bugle goes. Even now they might in the various centres of jaildom begin to talk things over to one another and above all formulate suggestions for the care of, or the benefit of, prisoners whether still in jail or set free, and for the philanthropic care of the relatives who depend on these whose goings have led them to undesirable ways and their still more undesirable termination.

The Inspector-General of Prisons would welcome any such formulated schemes and would bring them to the notice of Government with the names of the gentlemen who are volunteering to lend their time and their money.

It must be understood that wherever the word 'men' has occurred in the above notes, it has been used in its widest sense and includes ladies. It is earnestly hoped that many ladies will co-operate. Their assistance is of course especially needed for discharged female prisoners, and if the idea of extending help to the prisoners' families also comes into the scope of the proposed work, their help will be quite indispensable.

EDUCATION THROUGH SETTLEMENTS.*

By C. R. NARAYANA RAO, M.A., L.T.

A settlement for the purpose of educating the adult is defined as an association of persons with different, opinions and different tastes: its unity is that of variety; its methods are spiritual: it aims at premeation rather than conversion and its trust is in friends linked to friends rather than in organization. It is in this latter regards that a settlement differs from institutions like the Y.M.C.A. which has a similar ideal and its practices are based on lines enunciated in the difinition of a settlement. Even as an experiment in the field where there are so many agencies already operating for the diffusion of education among the working adults, the settlement institutions should have a fair trial. Settlements in the opinion of their organizers should appropriate to themselves by way of co-operation, part at least of the functions of the university, the church and the clubs. It requires all the fervour of a man who has seen visions of the "new world" to take charge of such a settlement which is to be filled with the spiritual and intellectual treasures of mankind before it enters on a practical stage of usefulness. No body will quarrel with the methods proposed to be adopted by the settlements to reach their ends, *viz.*, fellowship and service. The few institutions which have taken a very large part in public life and which we may call settlements are Mrs. Barnetts' "Toynbee Hall" and Miss Jane Adam's "Hull House." To some extent it is true that what a settlement requires is not finance or patronage,

* *Education Through Settlements* by Arnold Freeman, with a preface by A. S. Rowntree. George Allen & Unwin Ltd., London. Price 1s. 6d. net.

but a man of imagination and fervour who will co-ordinate his effort with other agencies along social, educational and spiritual lines.

The author writes from personal experience and the reader cannot escape from the belief in the immense potentialities of the method he describes. It is true that none can give an authoritative opinion on the settlement idea at this stage of its development, but as Mr. Rowntree says, "the virtue of this little book is that which informed from actual experience, it is all right with a healthy and refreshing imagination and is full of information and stimulating ideas for the guidance of those who may be thinking of establishing such institutions."

India is a long way behind the settlement idea. The university movement is slow, the country is split by creeds and dogmas: social life is practically unknown and women's education is just springing. But the reading of the book has a most stimulating effect on workers in the social and educational fields and if India should ever become a homogeneous country, the potentialities for the settlement movement are immense. We can only hope now for the speedy arrival of that day.

We take the following from the *Journal of the Society of Arts* for June:—At the request of the Mysore Durbar steps are being taken to contruct a harbour at Bhatkal, to provide a sea outlet for the State of Mysore. According to the Department of Overseas Trade, the formation of this harbour has been suggested for some time, and is one result of the commercial expansion of Mysore, which has been increasing for some years past. Schemes for the construction of the harbour have been submitted, including the provision of breakwaters to provide a safe approach during the period of the South-west Monsoon. Accommodation will be furnished for very large vessels, both in the inner and ... harbours.

STATE-HELP TO INDUSTRIES.

[The following is a report of the proceedings of the Conference of Directors of Industries held at Simla on 12th, 13th and 14th April last under the presidency of Sir Thomas Holland, President of the Board of Industries and Munitions.—Ed., M. E. J.]

It states that Sir Thomas Holland in opening the proceedings mentioned that one of the functions of new department of industries should be a kind of clearing-house of information through which the experience of the province could be brought to the notice of directors. All were agreed as to the desirability of constituting an Imperial Industrial service on the lines suggested by the Industrial commission and accepted by the Secretary of State. It was generally accepted that the staffs of the provincial industrial departments were at present inadequate and early steps should be taken to begin recruitment as soon as the size and terms of the service could be settled.

NEW INDUSTRIAL SERVICE.

The following was also agreed to by the directors:—(*a*) for immediate requirements and before the industrial service has grown up special appointments of comparatively senior men would be necessary; (*b*) such men might be admitted to the service on the pay of a grade which corresponded to their age; (*c*) in addition to mechanical engineer men with some ten years business trainin might be admitted, a number could be pro bably found who would be inclined to sacri fice the uncertainties of a business caree for the greater stability of Governm service; (*d*) schemes for provincial indu trial services should be worked out in t provinces; (*e*) the provincial service shou in time form one of the main recruiti grounds for the Imperial industrial servi (*f*) the Imperial service should so far possible consist of Indians; the Confere

was generally of the opinion that it was desirable to have provincial boards of industries and such should be advisory rather than controlling in character.

TWO JOURNALS TO BE STARTED.

Regarding means of securing co-operation between provincial departments of industries both mutually and with the Imperial department, it was decided that two journals would be necessary, first in four parts anually which would be for general publication, and second a monthly report for private circulation among directors of industries both being prepared in the office of Imperial Department of Industries.

INDUSTRIAL EDUCATION UNDER NEW DEPARTMENT.

The conference unanimously agreed that it was desirable that the control of such education as pertained to the industrial department be transferred from the director of public instruction to the Industries Department, due attention being given to the necessity of consultation with the director of public instruction both as to method of teaching and consideration of courses. No decision was arrived at on the subject of commercial education, it being considered desirable to postpone action until the future of the imperial commerce department was settled.

INDIA'S PARTICIPATION IN THE BRITISH INSTITUTE OF ART EXHIBITION.

It was considered unwise to take part in the British Institute of Industrial Art without full information from the Indian Trade Commissioner. The conference were unanimously of opinion that India ought to participate; they agreed also to the necessity of appointing a commissioner who would get into touch with the organizer of the exhibition at "home," tour throughout India, make arrangements with local governments, the forest department, and firms for their exhibits and accompany the exhibits to England; the general opinion was expressed that the exhibit should be arranged by provinces, as this method was likely to promote a spirit of rivalry and result in a better exhibition of Indian product. It was possible that Burma might have a separate building in order to show an example of Burmese architecture.

SETTLEMENT OF LABOUR DISPUTES.

As regards settlement of labour disputes the directors were informed that local Governments would shortly be addressed in a letter suggesting the consideration of the question of setting up some local machinery on the lines of the British Industrial Courts set in 1919.

IMPERIAL GOVERNMENT TO SUBSIDISE LOCAL INSTITUTIONS.

The conference was inclined to the view that it was generally better for the Imperial Government to subsidise local rather than build imperial institutions, and favoured the suggestion that the provinces should more or less specialise in different kinds of demonstrations, factories and such like, and reciprocate with each other in the matter of admitting pupils.

FINANCIAL HELP TO NEW INDUSTRIES.

Regarding financial and other forms of assistance for the new Industries conference, it was generally agreed that in cases which cannot be reached by banks but wherein the public interest, assistance is necessary, *e.g.*, to test the possibility of successful manufacture to show the way to others or to produce an article required for national safety, direct financial assistance may be given by Government as (I) guarantee of dividends, *e.g.*, in the case of large industries likely to pay dividends after a long period; (II) loans of money especially in the case of concerns with assets of a comparatively liquid nature; (III) agreements to purchase output, *e.g.*, in the case of articles not previously made in the country but required by Government for its own purposes; (IV) contributions to share capital especially in the case of concerns which are important for

national safety but which the Government does not desire to undertake under its own agency. In all the above cases there should be Government supervision including audit and inspection, agreements to fulfil the original objects, but Government directors, if appointed, should not act so as to delay decisions. The capital of the concern should be raised in India under conditions which will give opportunities to small investors and encourage Indians to participate in industrial ventures. Loans to small or cottage industries and to co-operative societies or financial help in the purchase of plant on the hire-purchase system, as in Mysore and Madras; in this case special legislation is necessary to provide suitable means for the recovery of outstandings.

PIONEER AND DEMONSTRATION FACTORIES.

The conference also discussed other allied subjects, such as pioneer and demonstration factories, sugar school for India, organization of the office of director of industries, and relative spheres of imperial and provincial departments in the matter of research.

NEXT CONFERENCE AT CAWNPORE.

It was resolved to hold the next conference at Cawnpore, probably about the beginning of November.

The statistics of the shipping of different countries passing through the Suez Canal in 1919 make very interesting reading. The total net tonnage amounted to 16,013,000, of which the British total came to no less than 11,355,000 tons. Our nearest competitor was Japan with 1,449,000 tons, the next highest figure being 754,500 tons. In view of the fact that this was the first year after the war, the superiority of British shipping is extremely gratifying. But the fact must not be overlooked that there is still much ground to be covered before the pre-war position is regained, and that some competi- ... much stronger position than

ECONOMICS IN THE WEST.

The Paper Shortage.

London, 17th June, 1920.—No doubt you in India have not failed to take notice of the discussion that has been proceeding here in recent weeks in reference to the paper shortage and the means that are desirable to reinforce the sources of supply of paper making material. Hitherto paper manufacturers both here and in America have relied mainly for raw material upon supplies of wood pulp made from spruce which grows in Northern regions. Canada, Newfoundland, Scandinavia and Russia were the countries chiefly drawn upon before the War, but the falling off of the Russian supply and the immensely enhanced demand since hostilities ceased have tended to create a serious shortage the effect o[f] which is world wide. In the emergenc[y] the paper makers are casting about for ne[w] sources from which they can obtain thei[r] raw material and all kinds of suggestions ar[e] being made as to the way in which the ex[-]isting deficiency in pulp can be made goo[d]. One of the most promising of the propos[als] put forward is that bamboo should [be] utilized for the production of pulp. Th[ere] are inexhaustible supplies of this wood [in] all the tropical regions of the Empire [and] if what tropical agriculturists and scient[ific] experts state is to be relied upon there [will] be no difficulty whatever in the future a[bout] raw material for paper making prov[ided] there is a proper system of organization [of] pulp manufacture. On this subject Prof[essor] Carmody who was for a time Directo[r of] Agriculture at Trinidad makes some inte[rest]ing statements in a letter to the *Times*. [He] alludes to an experimental factory [which] was recently established at Trinida[d for] making paper from bamboo. This v[enture] unfortunately has not yet been carried far owing to the fact that the leading ... of the firm owning it was killed

War. But Professor Carmody speaks with confidence of the practicability of manufacturing excellent paper from bamboo and mentions that he has in his possession a copy of the *Paper Makers' Monthly Journal* printed on bamboo paper made at the Ford Works Sunderland so far back as August 1879. In addition to bamboo the tropics, according to Professor Carmody, can supply large quantities of paper making material from "megass," the crushed and waste fibre of the sugar-cane. An actual experiment was made at Trinidad with this material in conjunction with para grass and the resulting paper found a ready sale locally for wrapping purposes. From all this it may be inferred that there is a vast field in every tropical country for the manufacture of paper pulp. The demand in the future for paper is bound to grow enormously with the spread of civilization and the possibility of a glutted market is very remote. The subject is one which should be taken up at once by the authorities in all British tropical dependencies and notabaly by the Government of India which has all the machinery at its disposal for the conduct of effective experimental manufacture.

FUTURE OF THE OIL SUPPLY.

Side by side with the discussion on paper shortage is proceeding a lively controversy in reference to the future of the oil supply. American sources of supply of this indispensable commodity are said to be giving out and alarming pictures are being drawn of a possible not distant failure of the export of oil from the United States. The position is probably not merely so desperate as some writers would have us believe as the States possess in the vast oil shale deposits of the Union a means of supplementing the supplies from wells which would yield if need be an almost inexhaustible alternative supply. But as far as Great Britain is concerned there is unquestionable cause for anxiety in the fact that so much of the country's supplies of oil have to be obtained from other than British sources. The Government are now doing their best to remedy this deficiency and judging by the outcry which is being raised in interested American quarters not without a measure of success. They have several strings to their bow, but at the moment the most interesting and valuable one is the Mesopotamian oil field. The potentialities of this region are enormous. In the belief of some experts, indeed, it is destined to prove the most productive of all the world's oil fields when fully developed. However that may be the authorities are leaving no stone unturned to ensure that the mandatory territory may yield the fullest quota of oil at the earliest possible opportunity. At the time of writing the decision has not been announced in regard to the method of working the field, but it is highly probable that the arrangement with the Shell and the Royal Dutch Companies will go through in spite of the strong opposition which has been developed against it in the avowed interests of exclusively British Companies. So far as the public at large are concerned it probably matters little who is entrusted with the development so long as the capitalistic combination is equal to the very big task that lies before it, and that the Shell and Royal Dutch Companies have the necessary resources is beyond question. Mesopotamia, however, will by no means exhaust the energies of the Imperial Oil Department which has been set up. The search for productive new fields is proceeding and almost any day we may hear that oil has been struck in some part of the Empire where its existence has hitherto only been suspected.

An admirable survey of the oil position as it exists to-day was made by Professor Sir John Cadman in a paper read before the Indian and Colonial sections of the Society of Arts recently. The statement contained some remarkable figures which are a wholesome corrective of the nonsense that is being written on the other side of the Atlantic about a forthcoming monoply of the world's oil

pplies by Great Britain. At present, Sir ohn Cadman pointed out, the United States ontrol at least 80 per cent of the entire roduction of oil in the world and Great Britain produces only about 2½ per cent of he whole, or if Persia may be said to be under British influence, about 4½ per cent. This tremendous disparity in favour of America is not likely to be altered materially to her disadvantage in the immediate future. The sources of supply that are being ex- ploited are in the undeveloped stage and it must be a good many years before we are able to do without American oil. Sir John Cadman strongly defended the British Gov- ernment from the accusation of selfishness in the prosecution of its oil policy in Im- perial and mandatory territory. He asserted that the field for the most part was an open one and that the foreigner was permitted to compete on equal terms with British subjects save that in some parts of the Empire cer- tain requirements as to British directorates and domicile are imposed ou petroleum pro- ducing countries, while foreigners are ex- cluded from India. As regards Persia, British enterprise was due to the individual initiative of Mr. W. K. D'Arcy who secured for his countrymen a concession which it was open to Americans or any other nationals to secure. An interesting series of tables embodied in the paper showed how the consumption and production of petroleum stand in the various parts of the Empire. India, it seems, consumes 1,146,000 tons and produces 1,292,000 tons,

THE TIN PLATE INDUSTRY.

India's entrance into the tin plate indus- try through the agency of the Tata Iron and Steel Company is considerably fluttering Welsh dovecotes. Not long since Wales was supreme in the manufacture of tin plates; but of recent years America has made great strides in the manufacture of these products and is a formidable, and [illegible] formidable, rival of the Principa- the Indian competition the more galling is the fact that the Tata undertaking had to obtain much of its machinery from the States instead of from Wales because of the exces- sive price charged for the Welsh equipment. It is felt that the day is past when the Welsh manufacturers could make their own terms in the market and that it will require all their energy and enterprise to maintain the industry in any thing like a flourishing con- dition. The trouble is the all prevailing one- the inordinate demands of Labour and the indisposition it manifests to give a fair day's work for a fair day's pay. Production in the States is on a far greater scale for unit than in Wales and manufacturers consequently are able to undersell the Welsh producers in most of the important markets. It is pro- bable that the lesson of this Tata transaction will not be lost on the Welsh trade. The British working man is no fool and he is not likely to jeopardise his position by continu- ing tactics which manifestly are producing such disastrous results for the trade which gives him his livelihood. But as far as Indian competition is concerned, he is doubt- less up against a proposition which will not be affected by any policy he may pursue. Tin plate manufacture in India is a natural and necessary development of the country's manufacturing industry and it must thrive if properly pursued as it doubtless will be.

SHEFFIELD INDUSTRY.

Sheffield industry is having the time of it life now that it has a free run for its manu factures. Before the War, Germany was formidable competitor in all but the be lines of cutlery and the city's enterprise w in many departments in a languishing co dition. Now all this has been changed the elimination of Teutonic rivalry. Ord for Sheffield's characteristic productions h poured in from all parts of the world and difficulty is to satisfy the extraordir demand. Much is being done, as I h mentioned in previous communications

the way of amalgamation of business interests and mass production, and much more will be accomplished in the same direction in the near future. But the astute manufactures of the Yorkshire city are not relying merely upon commercial arrangements to consolidate their position. They are giving serious attention to research work in order to develop the trade in new directions. Under the Government scheme there has recently been formed a British Cutlery Research Association to which most of the Great Captains of Industry in the city have given their adhesion. An income of £ 1,500 a year has already been assured for the organization and as the Government will contribute a like sum there will be no lack of funds for the initial operations. At a recent meeting of the Association a prominent citizen spoke of the great possibilities of improvement that were offered in every department of trade to a scientific system of study. Old as the Sheffield industry is it is still imperfect in many respects and it is only by a systematic application of modern principles to the processes of manufacture that it can hope to maintain the great position it occupies in the industrial world. Before the war Sheffield had to depend a good deal upon Germany for its material and much so-called Sheffield cutlery was really more German than British. This humiliating position is not likely to recur. Sheffield is now very wide awake and it will be difficult in future for any foreign rival to cross its path.

Production of Spelter.

One of the outcomes of the war was an arrangement concluded between the home Government and the Government of Australia for the acquisition of a fixed proportion of the zinc concentrates of the Dominion with a view to their treatment in the United Kingdom. The transaction arose out of the desire to prevent any repetition of the events which led to the monopoly by Germany of this important material which is indispensable alike for the operations of commerce and the manufacture of the munitions of war. Although the arrangement has not been long in force a protest is already being raised against the system which it is intended to set up of manipulating the ore in this country. The question was raised in prominent fashon a few days since at the meeting of the Zinc Corporation, Ltd., by Mr. F. A. Govett, the Chairman of the Company. Mr. Govett in the course of his remarks questioned the desirability of the Government subsidising the zinc smelting industry as had been proposed. "Spelter," he said, "can be produced far more cheaply in Belgium and elsewhere than we can produce in England, and cheap spelter is essential to the galvanizing trade. Therefore, so long as we are at peace, obviously the balance is in favour of importing the metal and not the material from which it is made. The same is true in war, for failing the retention of large permanent stocks in the country, either of spelter itself or of the ore or concentrates from which it is produced, we must then import at the risk of submarines. The risk in the same in either case, and the spelter naturally requires less ships than bulky concentrates and, therefore, the spelter is the lesser risk. There appears to be no reason at all why the nation should be taxed to support the industry on what to me appears an entirely illogical idea." In this argument Mr. Govett ignores the danger which the war showed to be a very real one, of the country, on the outbreak of war, finding itself entirely dependent on foreign sources for a material which was absolutely essential to the successful conduct of military operations. The economic argument, no doubt, is a strong one, but the question is whether this is not one of those cases in which economic considerations are over-ridden by the supreme need of ensuring the safety of the State. Certainly, there seems every reason why we should at least keep control of the industry, and that can hardly be done if we turn over to the Belgians or any other nation, the practical monopoly of the manufacture of the product. At the same time there is good deal to be said for the view that it would be unwise minimise to attempt to restrict the manufacture of zinc to this country. A better system would be to distribute the work taking care to maintain a hold on a substantial part of the output so that it would be available in the event of war. For example, India might have her share and so provide material which she would need for the manufacture of munitions. The submarine argument would not apply in her case; and probably it would be found in practice that with her economical labour she could turn out spelter as cheaply as Belgium is able to do. The question is well worth attention both from the commercial and the military standpoints.

Arnold Wright.

DUSTRIAL NOTES FROM THE UNITED STATES.

Machine Weaves Wicker Furniture.

'ashington, D.C., U.S.A., June 29, 1920.—r some five thousand years man has been :aving wicker baskets and furniture by icking upright stakes, or the weft, into a ame, then weaving the warp in and out. his process for ages past has always been manual one. Until a few months ago, in act, manufacturers of woven baskets, furni-ure and baby carriages actually asserted hat it was an absolute impossibility to invent a machine to do this work. But, as has happened in many other instances, the machine has been built, patented, and is now in extensive use in the United States. The industrial importance of the invention will be realized when it is stated that a well known London firm has just paid to the American inventor $1,500,000 for the British rights to manufacture the machine.

This interesting invention was made possible by a radical departure from the traditional manual method. Weaving, that is, is not done on the frame and in the final shape. Instead of this the frame is built in one part of the factory and the wicker fabric is woven in another. The last step is, of course, the application of the wicker fabric to the frame.

The loom is a revolving machine to which the stakes, or weft, are fixed over a pattern. The wicker, wrapped on two spools at the sides of the loom, is fed into it through an overhead tension pulley. As the loom revolves the wicker passes from the pulley to the shuttles, two of which are found on each machine. Emerging from the shuttles, the warp is met by star-shaped wheels which press alternate strands to either side. After the warp is woven thus a metal finger descends and presses it into place. So the ... thirty times the until the basket, chair or baby carriage fabric is finished. The loose ends of the weft are then bent over and firmly secured, finally, by hand, as in the old process.

FIGHTING FOR HEALTHY PLANTS.

The science of plant pathology, or the investigation and control of the diseases of plants, particularly those caused by fungi, has been pushed forward of late with the greatest rapidity in the United States.

During the period of the war, American experts in this field from the different states co-operated very closely to save as much as possible of every crop from the ravages of disease, and during the summer of 1919 this idea of co-operation was continued and extended with great success.

In the neighborhood of New York City two very important field meetings were held, one on Long Island (adjoining New York City) and one at New Haven, Connecticut, for the study of diseases common in those localities.

The first meeting (in June of last year) for the study of potato diseases in particular, was attended by about one hundred and fifty plant pathologists representing many parts of the United States, England, Holland and other countries. The farmers furnished motor cars and tours were arranged for the chief potato-growing sections of Long Island. In the evenings, mosaic, leaf-roll, wart disease, and other potato troubles which have been found difficult to combat were discussed at great length and from all viewpoints, with the best experts in the world on the spot to put their heads together and work out the best methods of control. This they did, and with great success.

The second meeting was held in August, 1919, and was attended chiefly by experts in plant pathology from the New England states and New York. Automobile tours covering a distance of 300 miles were made to plantations, gardens and nurseries between New Haven, Hartford and Storrs, Connect... ...hile every evening of the week w...

devoted to papers and discussions. The largest green houses in America were seen at Cromwell, where 22 acres are under glass in a single building, one house being 800 feet long and another 600 feet square, the latter being entirely filled with roses. The largest elm tree in the United States, if not in the world, is at Wethersfield, Conn., and is 30 feet in circumstances, 97 feet high, and 300 years old.

A day was also spent in the tobacco growing regions of Connecticut, where broad-leaved tobacco is grown in the open, and the narrow-leaved varieties are cultivated under great tents. At one place were seen 290 acres under cloth.

NEW DAIRY PROCESS REDUCES MILK TO POWDER.

Although many bakers, confectioners and ice cream manufacturers have been using it for some time, only recently has the world learned the real value of powdered milk. The general public of nearly all countries still knows almost nothing, in fact, about this remarkable new commodity which can be stored almost indefinitely, then can be retransformed into fresh, sweet, nourishing milk by the addition of a proper volume of water.

Powdered milk is going to be very widely used throughout the world when it becomes generally known that the stuff will not freeze in winter nor deteriorate in summer, and that it can be shipped in quantity at a small fraction of the cost of transporting the liquid milk.

The milk is converted into the powder by an interesting patented process, which is, briefly stated, as follows:—After careful test the milk is poured into vacuum pans, where part of the water is extracted at a temperature which does not coagulate the albumen. The resulting liquid is then forced at high pressure through tiny holes in metal plates. It emerges as fine spray into a current of heated air. As the moisture is absorbed by the parched air the suspended solids fall, like drifting snow, to the floor of the process chamber. This powder, resembling the finest white flour, contains less than two per cent of moisture, and on tests is found to harbor no bacteria, whatever. The warming and spraying produce absolutely no chemical effect or change.

It is said that the series of experiments which resulted in the perfecting of the powdered milk process covered over three years.

TRACKLESS LOCOMOTIVE RUNS OVER AMERICAN HIGHWAYS.

As I write, somewhere between the states of Indiana and California a locomotive on rubber tyres is tooting its whistle and ringing its bell for the right of way on the national highways—the first trackless railroad engine to make the long trip from the Atlantic to the Pacific coast.

The strange vehicle is really an automobile rather than a locomotive, of course, but it is far from being merely a car with a freak body. From the rivetted steel boiler with its smokestack exhaust to the cab, and back of that the short tender, the whole machine is built in exact replica of a modern railroad engine, and built to stand the roughest of treatment. It is mounted on a chasis of 145 inch wheel-base equipped with a six-cylinder, 90 horse-power motor, and is capable of speeds up to 50 miles an hour. The total length is 21 feet, the width 5 feet, 8½ inches, and the height 7½ feet, the weight being 5,000 pounds. All the controls and guages are in the cab, located above the fire box, in regular locomotive style.

The curious machine represents the handiwork of a well known Indian automobile enthusiast, whose particular hobby is the construction of queer cars. They are now to be manufactured on a large scale by a leading middle west motor building company.

MACHINE DISINFECTS SMUT-THREATENED GRAIN.

Heretofore the progressive cereal farmer has tried to avoid loss by smutting of his

harvest by utilizing tubs, barrels and similar containers, in which he has mixed his formaldehyde solution, and soaked his sacks of grain. This process is necessarily slow and is often unsatisfactory. Now, however, the farmer most effectively can fight this parasitic fungus with the aid of a simple machine which quickly disinfects each grain without soaking it, or wasting a drop of the solution. The machine consists of a conical grain hopper and a solution reservoir. As the two outlet valves are turned, grain and solution and fed by gravity to the conical mixer, where they are rapidly mixed by a whirling cone. As this cone is revolved by the weight of the down-pouring grain the machine requires no attention other than the occasional filling of the hopper and reservoir. The disinfected grain pours out of the bottom of the mixer. Attended by two men, the machine has capacity of from 100 to 125 bushels an hour.

A NEW ELECTRIC WATER HEATER.

A nationally-known electrical authority makes the statement that his experience with ordinary electric water heaters of the resistance type has been unsatisfactory, as the wire burned out frequently and had to be replaced. This difficulty, he states, has now been satisfactorily solved by the use of a heater employing no high-resistance material and having practically nothing to burn out. In short, says he, it is built on the principle of a welding transformer: The coil of copper tubing through which the water circulates also carries the current which heats the tubing and the water inside. This current, flowing in a circuit of such low resistance, depends on the production of a low voltage by induction, as in any ordinary transformer.

The transformer core is of the shell type, having the windings about the central member. The instrument is mounted at the side of the water heater, and the water is piped f— the bottom of the tank to the lower end [illegible] On emerging into the tank, entering at the top, so that whatever water is heated ready for use will remain for some time at the top of the tank, not mixing with the cold water below.

The coil of copper tubing, besides conducting the water, forms the secondary (or low voltage) coil of the step-down transformer, developing about two volts. This amount is sufficient to send only small current through the coil of tubing when the circuit includes the water tank and the iron piping to and from it. When, however, the two ends of the tubing coil are short-circuited by connecting across them a piece of heavy fuse wire the resistance of the secondary coil becomes very low, and a heavy current flows through it, heating the tubing, and hence the water flowing through it. The short-circuiting conductor should be made of such a size of fuse wire that, should the system go dry or overheat, the fuse will blow, thus leaving only the circuit of higher resistance through the iron piping and tank.

While a transformer of this type cannot be expected to attain a very high electrical efficiency, still the heat is transferred very directly from the tubing in which it is developed to the water flowing through it. Hence the water wastes hardly more heat than on which is submerged in the water to be heatec and has the advantage of containing no resis ance element which is likely to burn ou The heater described uses from 500 to 1,5(watts, depending chiefly upon the resisten of the short-circuiting fuse. The tank heated to the boiling point in about fifte minutes.

AUTOMOBILE CONTROLLED FROM AFAR BY WIRELESS.

Simple as its secret of operation may b the wireless expert, the distant control motor-driven vehicle is always a str and wonderful performance to the layma

A small electric automobile weighing a 250 pounds, recently built by a New state inventor, is mystifying large nur — by its antics under inv

but very effective, guidance. The operator sends out the actuating wireless waves from a signal-corps field set mounted on his auto, the antennae wire being stretched to the nearest tree or post. The first pressure of the key starts the little car off on a straight line, from which it is turned to the right by a second pressure. A third impulse straightens it out, a fourth turns it to the left, a fifth straightens it out again, and a sixth stops it.

All of these movements are accomplished by switch bars on a drum in the car, which connect local batteries to the proper starting, steering or stopping magnets. A ratchet arrangement rotates the drum one step at each wireless impulse.

When the operator wishes the car to skip some of the sequence of movements he sends out two or more impulses in quick succession, and the mechanism obeys only the last one. A tall mast on the car bears a green pilot light at its top, its flash telling that the circuits are in good working order. So promptly and accurately does the little vehicle respond to its distant control that its inventor has steered it successfully through a large throng of people.

High-Pressure Steam Drives Small Tractor.

Although steam was the original motive power used for tractors, certain advantages of the internal combustion engine have brought it to the front in recent development.

Now, however, a new steam-driven tractor has made its appearance, in which all the refinements of modern practice are incorporated. Ths new tractor is being widely adopted in many sections of the United States. It has a water-tube boiler with 34 half-inch tubes, 11 feet long, and delivers superheated steam at 550 pound pressure. No scale is formed in the tubes, which are removeable and may be adjusted to any desired power.

The two-cylinder engine runs at 20 to 800 revolutions per minute, delivering 26 to 70 horsepower to the 60 inch driving wheels. The whole machine, which is less that 12 feet long, 5½ feet wide, weighs but 3,500 pounds. It runs at any speed between ⅛ and 7½ miles per hour, and its burners are adapted to the use of either kerosene or distillate as fuel.

Automatic Coupler Converts Wagon Into Truck Trailer.

A coupling arrangement for the back of a motor truck that enables it to be backed under the front end of a wagon and automatically connected, making a semi-trailer, has just been placed on the market by a Massachusetts manufacturing firm. The coupler is similar in form to the "fifth wheel" of a wagon, but is pivotted transversely to give flexibility to the system, and provided with coil springs to take up shock. The bolster plate and upper circle of the attachment are fastened to the wagon bed in place of the regular fifth wheel, and slide into locked engagement with the truck portion when they are brought together. It is disconnected by pulling a lever from the driver's seat.

Alfred T. Marks.

The Madras Publicity Bureau says:—As soon as the Local Government (Borrowing) Rules are brought into force under the Reforms Scheme the Local Government may, with the previous sanction of the Government of India, raise loans to meet capital expenditure on the construction or acquisition of any work in connection with (1) the improvement of irrigation or communications, the supply of electric power for industrial purposes, (2) building or housing schemes, (3) schemes for the drainage or reclamation of land, for the development of forests and forest industries and for certain other purposes. The Madras Government have accordingly asked heads of departments to submit a list of development schemes already sanctioned or under consideration which might be financed from borrowings under these rules.

NOTES.

In regard to the impression which commonly obtains to the effect that aviation is still a more or less dangerous pastime it is interesting to note some facts obtainable from the latest returns. It appears that during 1919 there were established at least thirty air stations to which the public had access for flights. In the six months from May 1 to November 1 approximately 30,000 passengers were taken for joy and business rides, and during the whole of this time, and in connection with every one of these trips, not a single accident occurred. It must also be mentioned that the daily passenger-carrying service between this country and Paris has run now for over a year without the slightest hitch except such as have been due to extraordinary climatic conditions. In fact, it may be said without hesitation that so far as reliability and freedom from interruption are concerned, this service compares favourably with that of any coastal or ocean-going steamship service. During the recent Peace Conference the aerial transport service, which everyone knew was running, carried no less than 700 passengers altogether without delay. In fact, the record says: "With perfect security and regularity." When we consider that the aeroplane is capable of what can only be regarded as stupendous feats as regards output of power, reliability, and regularity of running, the prospects for civil aviation are really extraordinarily bright in spite of the clouding effect which official indifference has had. It is not in the nature of things that anything capable of carrying immence weights at immense heights at immense speeds should be relegated. Obviously a machine which can cross the Cordilleras at a height of over 20,000 ft. is rather more than a toy. Between Valparaiso and Santiago an aerial mail service has been in operation for some time, and we have yet to learn that it has suffered any interruption. American air services in particular have been marked by their regularity and reliability, and it is to be hoped that civil aviation in Great Britain is now about to receive that recognition which is its undoubted right.

∴ ∴ ∴

An engineering correspondent writes to the *Near East*:—Some little time ago I had an opportunity of inspecting the "Glasgow" tractor and comparing it mentally with the dozens of different types of British, American, and Italian tractors it has been my fortune to inspect during the past three-years. I may say at once that I have formed a very high opinion of the "Glasgow," which, by the way, is one of the many products of the British Motor Trading Corporation, Limited. In design it is a three wheeled vehicle which is noticeable in that it has a drive to all three wheels. This not only leads to the perfect utilization of the power generated, but it ensures an adequate wheel grip under all conditions. No matter whether the soil is sandy or clayey, wet or dry, the tractor may be relied upon to do its work in the best possible style. It has a four-cylinder engine of $4\frac{1}{8}$ by $5\frac{1}{2}$" inches bore and stroke, and is rated at 25 horse-power, but it is, of course, capable of giving out a larger amount of power should it be required. The engine is fitted with a Piercetype governor controlling the engine speed, and a combined system of forced feed and splash lubrication is adopted. The tank has a capacity of 14 gallons, and other features worthy of notice are the gilled tube radiator, the Halley carburettor, and the high-tension magneto. Two speeds and a reverse are provided, and on top gear a speed of five miles per hour is attainable. The tractor, I should judge, is particularly suited for work on bad ground and on steep hills.

∴ ∴ ∴

The British Consul-General at Osaka writes:—A new company, called the Naniwaya Company, Limited (Kabushiki Kaisha

Naniwaya), has been formed at Osaka, the object of which is to erect a building and use part of it as a department store, while the remainder will be let for office purposes. A site of 2,000 tsubo (8,000 square yards) has been secured at Nakanoshima, in the business section of Osaka, and it is planned to erect a building which can compete with the seven storey store of Mitsukoshi, the pioneer firm of foreign style enterprises of this nature in Japan. The nominal capital is to be Yen 30,000,000, divided into 600,000 shares of Yen 50, of which the promoters and the vendor of the land will take up 580,000, leaving only 20,000 for public subscription. The construction of the building will probably require two years. Doubtless the articles stocked by the various departments of the store when completed will be principally Japanese, but there will also be an opening for fair quantities of miscellaneous foreign goods, such as tinned goods, liquors, haberdashery, fancy goods, toys, and furniture. A taste for foreign goods already exists among the Japanese, especially those who have been to Europe or America, or whose business brings them in contact often with foreigners, and the recent increase in the numbers travelling should augment the demand.

∴ ∴ ∴

The latest statistics regarding the development of the French Protectorate of Morocco illustrate very clearly the remarkable character of the work accomplished by our ally in that country in the space of a few years. Last year the area under cultivation was about 6,000,000 acres, as against 2,500,000 acres in 1912. The growth of communications is even more striking. There were six miles of roads in 1912, but by 1919 there were 1,500 miles, Progress in railway construction has also been considerable, though naturally not in anything like the same proportion, and developments in this direction have been to a great extent postponed on account of the war. When the programme of construction has been carried out, however, Morocco will be admirably situated as regards transport facilities. The development of agriculture and the extension of communications have naturally brought a great expansion of commerce, exports rising from £2,680,000 in 1912 to £8,280,000 in 1919.

∴ ∴ ∴

It is not presumed that any Municipal Corporation in India will achieve success in establishing a Municipal Bank. But nevertheless it is of interest to note that a project is afoot to establish a municipal bank in London. It is proposed to model the scheme closely on the lines of the Municipal Bank already in successful operation in Birmingham, where the first institution of the kind was inaugurated in 1916 by Mr. Neville Chamberlain. The bank gives 3½ per cent interest to depositors, and lends money to the Corporation at 4 or 4½ per cent. The policy on which it is conducted, however, is not to make a profit by municipal banking, but to foster the savings habit among the wage-earning classes, to stimulate local patriotism, to invest in civic enterprises, and to augment the financial resources of the local authorities. All these objects seem to have been reasonably realised by Birmingham's Municipal Bank, which now records over £1,000,000 in receipts from some 50,000 depositors. An example worth pondering.

∴ ∴ ∴

Speaking on the subject of "Rubber for Industrial Purposes" recently, Mr. C. E. Alsopp, at the Technical College, Bradford, enumerated the many uses to which rubber is put to-day in industry. From an engineering point of view rubber is one of the most useful products known, and it is certain that our automobile industry would not have developed so fast or so far had it not been for the suitability of rubber for tyres. Vulcanite is another form of rubber which is largely used by engineers. Mr. Alsopp dealt in detail with the early discovery and cultivation of the rubber plant, and said that whilst the production of wild rubber was stationary that of plantation rubber was steadily increasing. About 90 per cent of the world's total production of plantation rubber is handled by British companies, and about 83 per cent is obtained from British territories.

GLEANINGS.

The Cotton Research Association has issued its first report outlining an important programme of research work. The chief aim will be to arrive at the principles or theory underlying the practice of the cotton industry, leaving the application of the theory to those actively engaged in the industry, but it is fully recognized that applied research cannot be entirely omitted, especially in respect of such matters as may be considered beyond the resources of individual firms. The necessity for applied research was pointed out in our special Cotton Section, and we trust that in this matter a programme will be drawn up on thoroughly practical lines. The activities of the association, which after unavoidable delay is only now entering upon its natural work of research, will be watched with interest.

∴ ∴ ∴

Japan has discovered a new fibre to mix with cotton, which promises to cause a revolution in cheap fabrics in the Far East, says the *Japan Magazine*. It is a kind of sea grass known as sugamo, which, when properly treated and mixed with raw cotton, makes a thread strong and useful for cheapening the material, which is now so high in price. The annual value of row cotton imports to Japan is about 300,000,000 yen, with about 18,000,000 yen for ramie and 52,000,000 for wool, but if the mixing of raw cotton with sea grass proves a success, such large imports of raw cotton will not be necessary. This sea grass flourishes plentifully about the shores of Japan. The botanical name of this grass is *phyllospadi sconetein*.

∴ ∴ ∴

For the purpose of developing the beet-sugar industry Australia has inspected such factories in America, and intends incorporating the most up-to-date machinery for the treating of sugar beet into an Australian plant. The University of California has been asked to select a quantity of the best beet seed for the production of this sugar beet. The Victorian Government has also purchased from America a fruit-drying plant, by the use of which all danger of the Australian fruits being spoiled by rain in the process of drying is to be obviated.

∴ ∴ ∴

Consignments of German goods are beginning to arrive in Colombo. According to a Colombo message, the N. Y. K. steamer "Durban Maru" recently brought lace and other sundries for four well-known firms. The prices are said to be considerably higher than pre-war, but the quality is much superior to the cheap Japanese articles with which trade has been flooded since 1914.

∴ ∴ ∴

A recent article in a Japanese paper points out that of the industrial products of Japan, which amount to $ 1,850,000,000 per annum, 45 per cent consists of textiles, 32 per cent articles of food and drink and chemical goods, and only 14 per cent machinery. Machinery is hardly exported at all, but it is imported to the value of $ 1,500,000,000 to $ 200,000,000.

∴ ∴ ∴

The total exportation of sugar from the Dutch East Indies in 1919 amounted to 1,819,475 tons, compared with 1,416,911 in 1918. The United Kingdom took 77,100 tons in 1918; 295,363 tons in 1919, compared with 271,922 tons in 1917.

∴ ∴ ∴

A new coffee exchange has been established at Santos (Brazil). It will be 70 metres long and consist of 3 storeys. At the official exchange founded two years ago, over 60,000,000 bags of coffee have been sold.

∴ ∴ ∴

Speaking recently at the Social and Political Education League, Law Auldane said that "the present education ladder is too narrow and too little used."

∴ ∴ ∴

A correspondent writing to the *Times* (*Trade Supplement*) says, that "Japanese competition in the Indian market seems likely to prove more serious than is generally realized."

ECONOMIC NOTES.

FRUIT CULTURE.

To Prevent the Rapid Decay of Ripe Fruit.

The *Farmers' Journal* says:—

Certain experiments have recently been conducted in the Jodrel Laboratory, Kew, with the object of ascertaining the relative value of various substances in preventing the rapid decay of ripe fruit. These experiments were based on the fact that the primary cause of decay and rotting of ripe fruit is in most cases due to the presence of the germs of fungi, yeasts, bacteria, etc., on the surface of the fruit and not—within a definite limitation of time—to any inherent tendency on the part of the fruit to decay. Among the various substances experimented with commercial formation=(formalde-hyde, 40 per cent) proved to be most suitable on account of its efficiency, cheapness and ease of application and because of the entire absence of danger in its use. The method of the treatment is here reproduced.

"In the case of fruits, where every part is eaten, as strawberries, etc., the fruit should be immersed for ten minutes in cold water containing 3 per cent of commercial formalin. On removal immerse the fruit for five minutes in cold water, and afterwards place it on wire netting or some similar open material to drain and dry. When the fruit has a rind or skin which is not eaten the immersion in water after the treatment in formalin can be omitted with advantage."

During the season a good series of experiments have been conducted at Kew, for the purpose of checking the results previously obtained, and of experimenting with other kinds of fruit. No special selection was exercised in procuring the fruit for experiments. The plums, cherries, grapes and pears, were purchased at a local fruit shop, and the gooseberries and bananas were obtained from a street vendor. In each case a certain portion of the fruit was treated with formalin; this was placed alongside an untreated portion on a plate of glass, the two were covered with a bell-jar, and exposed to the ordinary temperature of the laboratory. The following table shows the number of days that treated fruits remained perfectly sound, free from mildew, after the untreated check fruit had become covered with mould and quite unfit for use:—

Plums	Damson ...	... 9 days
	Victoria	... 6 ,,
Bananas	...	... 10 ,,
Currants	Black	... 5 ,,
	Red	... 4 ,,

The following table shows the kind of fruit used last year for testing the preservative properties of formalin, and indicates the number of days during which treated fruit remained perfectly sound, after the check or untreated fruit had become unfit for use. The first column of figures indicates last year's experiment, the second column to this year's corroborative experiments.

Cherries	7 days	8 days
Gooseberries ...	7 ,,	6 ,,
Grapes	4 ,,	6 ,,
Pears	10 ,,	9 ,,
Strawberries ...	4 ,,	5 ,,

It is important to remember that all kinds of fruit experimented upon were ripe and been exposed for sale, and were consequently exposed to infection, and that in some instances they were more or less bruised. With fruit carefully gathered and treated at once, the duration in a salable condition might be anticipated to extend over a long period of days than is indicated by these tables. In the case of apples that are just pitted with disease, treatment with formalin proves of service. Apple rot caused by fungus called Glocosporium fructigenum, Berk, is very destrutive to ripe fruit, on which it first appears as minute scattered spots on the skin; these spots rapidly extend and form large, brown sunken patches; within a short time this fungus reduces the fruit to a brown rotten mass. A dozen apples showing the first stage of this disease were immersed for a quarter of an hour in a solution of formalin of the strength given above, and afterwards dried. This was done during the last week in August, the spread of the diseased parts was completely arrested, and the apples were at the end of November in good condition. A dozen similarly affected apples collected at the same time but not treated with formalin, were completely rotten by the end of September. By employing the method of treatment described, pitted or slightly diseased apples can be kept in a condition fit for use for several weeks longer than when no treatment is applied. This is a point of importance both to grower and fruit dealer. In the case of householders, and others who store a quantity of apples for winter use, it would well repay the very small trouble incurred to treat apples previous to storing. The method is simple, put ten gallons of water (preferably rain water) into a cask or zinc bath; add three pints of formalin, mix thoroughly;

then immerse as many apples contained in a net or loosely-woven sack, as the water will cover. The fruit after remaining in the solution for ten minutes, the sack being partly lifted up to ensure every part of its contents coming in contact with the liquid should be removed from the sack and placed on a layer of straw, hay, or some suitable substance to drain and dry. It is not necessary to immerse in water, after their removal from the formalin mixture apples that are intended for storing. Plums, strawberries and other soft fruits should be placed in a sieve or some such firm open structure for immersion in the solution. The strength of the formalin solution does not deteriorate by use, so that the process of sterilizing batch after batch of fruit, can be continued until the solution is practically used up in the process.

FOR TROPICAL FRUITS.

However valuable the method of fruit preservation described here may be in extending the duration of ripe fruit in good condition for local use, the greatest benefit, will be in connection with export fruit. Many kinds of tropical fruits, which owing to their rapid deterioration and decay are never sent on long journeys, could be exported if treated in this manner before shipment. The fact that many tropical fruits decay very quickly in their native country is, in reality, no argument against the suggestion. It only indicates that in the warmer countries, as in every other land, the surface of every ripe fruit is loaded with spores of fungi, wild yeasts, etc., which attack the tissues and set up a fermentation that is often mistaken for the normal decay due to over-ripeness. As an example the state of semi-decay in which bunches of bananas frequently reach England is, in most instances, entirely due to the attacks of various superficial organisms capable of inducing fermentation. This could be prevented by the adoption at the port of shipment of the treatment recommended above.

COMMERCE AND INDUSTRIES.

Forest Research and Experiments in the Bombay Presidency.

The following extracts are taken from the Administration Report of the Forest Circles in the Bombay Presidency (including Sind) for 1918-19 :—

NORTHERN CIRCLE.

Tarwad (*Cassia auriculata*) propagation was continued. 21·5 tons of seed in 1918 and 9·75 tons in 1919 were collected and distributed to various places within and beyond the Presidency—a most creditable performance. In the circle 1,110 acres in 1918 and 167 acres in 1919 were completely sown with seed and 8,887 acres in 1918 and 4,900 acres in 1919 were partially sown by various methods in the Panch Mahals, Surat, North Nasik and West Nasik Divisions, the other divisions being not suitable to it. The results are reported to be good. 50 per cent of the seed sown last year lay dormant and germinated this year and 75 per cent of that sown in 1919 came up plants being 2 to 4 inches high and doing well.

Rosha oil.—A portable steam double still was experimentally erected in North Nasik. The only stuff available was poor and dry which ordinarily would not be used. This was treated and though the percentage of oil was low, the product was of better quality than the best oil by the country process.

Timber conversion.—A portable saw mill lent by the Executive Engineer, Nasik, was worked in Peint, as an experiment. The outturn was not satisfactory, owing to want of expert supervision. The establishment of two or three saw mills in these forests under expert assistance is very desirable for utilizing to the best advantage much inferior, stunted teak and junglewood material now going to waste.

CENTRAL CIRCLE.

Tarwad was sown in all the divisions except Kolaba with the same results as in the Northern Circle.

Of the Eucalyptus plants in North Khandesh mentioned last year, half were killed by white ants but those surviving are doing well. Also the Grevillea plants are reported to be growing well.

The work of Sallai (*Boswellia serrata*) tapping was continued in the same division and 3 cwts. of Gum-oleo-resin were supplied to the Institute at Bangalore and 4 cwts. to the Eastern Development Company, Limited, Bombay, for experiment; tapping is still being continued to meet further demand

The Divi-divi (*Cæsalpinia coriaria*) seedlings transplanted in the preceding year in Kolaba are doing well.

SOUTHERN CIRCLE.

Tarwad was also sown in the dry parts of this circle with no good results owing to severe drought.

The experiment of sowing teak after clear felling and burning in the Kanara High forests was promising but with a partial failure due to the same cause.

Samples of fibre from Tali-palm (*Corypha umbraculifora*) leaf stalks forwarded by Mr. M. S. Tuggerse from Mahime forests in Southern Division, Kanara, were sent to the Director of Industries and to Dehra Dun. This fibre has since been reported on by commercial experts as being full of promise and further enquiries are going on.

SIND CIRCLE.

The Divi-divi plants put out last year in Sukkur are doing well. The *tarwad* sowing was carried out as last year with partial failure owing to frost to which the plant is very susceptible. The propagation of lac was continued but no marked results were obtained.

GENERAL.

(1) *Woods suitable for rifle stocks.*—The two species *Terminalia tomentosa* and *Pterocarous Marsupium*, which have been pronounced as likely to be suitable for the manufacture of rifle stocks, are both found in sufficiently large quantities in the Northern and Southern Circles and at one time the Indian Munitions Board had intended for a supply of a hundred tons for the purpose. Seasoning experiments have been undertaken in the Southern Circle and results are still awaited.

(2) *Woods suitable for embossing work.*—At the instance of Messrs. A. Willing and Company, Bombay, the Director of Industries made enquiry about woods suitable for embossing work. The following species which are found in this Presidency have been recommended for trial :—

Adina cordifolia ; Stephegyne parvifolia; Chickrassia tabularis; Cedrela Toona; Odina Wodier; Gmelina arborea; Dillenia pentagyna ; Hollarhena antidysenterica.

(3) *Woods suitable for brush-making.*—Messrs. H. Bevis & Co. of Cawnpore having made enquiries about woods suitable for brush-making, samples of—

Holarrhena antidysenterica,
Carallia integerrima,
Canthium umbellatum,

were supplied. Results are awaited.

(4) *Woods suitable for making "Gur" cases.*—The Director of Industries made enquiry about woods suitable for making "Gur" cases and tea-chests. *Terminalia paniculata* was recommended and approved. Arrangements for cutting up this wood and supplying "Gur" cases have been made in the Kanara Central Division, Southern Circle. This wood occurs in large quantity and of great size in the Kanara forests and is not much in demand for anything else. It hardly pays to bring it in logs to depot for local demand.

(5) *Woods and nuts suitable for button-making.*—Fruits of *Corypha umbraculifera* (vernacular "Tale ;" the Umbrella Palm) which is plentiful in Kanara Southern Division, and woods such as *Dalbergia Sissoo, Santalum album* (Sandal), *Memecylon edule*, etc., have been recommended as suitable for the manufacture of buttons in response to a query from Mr. Dyer, Mechanical Engineer to the Government of Bombay.

(6) *Crewia tiliæfolia* which is available in large quantity in Kanara and Belgaum was experimentally supplied, tested and found suitable for aeroplanes but trees yielding sufficiently flawless trunks being very scarce, there was no actual order for it from the Munitions. The same species is recommended to the Director of Industries as suitable for making casks as containers of vegetable oil.

(7) *Cæsalpinia brevifolia*, the pods of which are known to contain 50 per cent tannin and to have a tannin value superior to Divi-divi *Cæsalpinia coriaria*) has been recommended for experimental cultivation in dry regions. Seeds supplied by the President, Forest Research Institute, Dehra Dun, have been sent to all the circles for being tested in dry localities. The first available harvest of pods will be sent to the Forest Research Institute, Dehra Dun, for valuation of their tannin-contents and then the feasibility or otherwise of their cultivation on a commercial scale in the successful regions will be considered.

(8), *Tarwad.*—As regards the cultivation of *Tarwad* experimental sowing made in all the circles in 1918 were not encouraging owing to the failure of rains in the Northern and Southern Circles and to excessive frost in Sind ; however, fresh sowing have again been made in 1919 and, judging by the results after normal rains, it will be possible to form a fair idea before the close of the present year regarding the advisability of proceeding with the cultivation on a large scale.

(9) *Lac propagation.*—The system of exploitation through contract agency in Sind having proved defective, as in that no measures were taken to ensure the future crops and to propagate the lac, departmental collection is being tried. Mr. C. M. Harlow of the Indian Forest Service who has been

appointed by the Government of India to conduct an enquiry into the lac industry is to visit the lac districts in Sind during the current cold weather. The results of his enquiry will be awaited.

(10) Samples of the following fibre plants have been supplied to the Director of Industries for experimental purposes:—

1. Sida rhombifolia.
2. Sida acutifolia.
3. Hibiscus cannabinus.
4. Thespesia Lampas.
5. Thespesia populnea.
6. Kydia calycina.
7. Bombax malabaricum.
8. Sterculia urens.
9. Sterculia colorata.
10. Sterculia guttata.
11. Helicteres isora.
12. Frioloena Candollei.
13. Grewia 'iliœfolia.
14. Erinocarus Nimmoanus.
15. Crotolaria juncea.
16. Spatholobus Roxburghii.
17. Butea frondosa.
18. Butea superba.
19. Bauhinia racemosa.
20. Bauhinia Vahlii.
21. Bauhinia malabarica.
22. Bauhinia variagata.
23. Albizzia stipulata.
24. Hardiwickia binata.
25. Careya arborea.
26. Caseria glomerata.
27. Calotropis procera.
28. Cordia Myxa.
29. Ipomœa Turpethum.
30. Dolichandrone falcata.
31. Aloe.
32. Ficus rumphii.
33. Trema orientalis.
34. Saccharum arundinaceum.

Results are awaited.

(11) *Bamboo pulp paper industry.*—The Kanara District is reserved for the scope of experiments by a syndicate under the management of Messrs. Turner Morrison & Co. of Bombay as to the possibilities of the manufacture of bamboo paper pulp on a commercial basis for a period of two years.

PREPARATION OF BEESWAX.

In an interesting article the *Jamaica Agricultural Societies' Journal* says:—

Modern methods of bee-culture, as adopted in most European countries, Australia, the United States of America and elsewhere, have for their primary object the production of honey, since the latter realises a better price than wax. In former times when bees were kept in "skeps" or boxes a large number of swarms were destroyed annually, and the whole of the comb, after the honey had been extracted, was converted into wax. As one result of the use of moveable box hives it is no longer necessary to destroy all the comb, but merely to remove the cell-capping and extract the honey by means of a machine. The empty comb can then be returned to the hive and re-filled. As bees consume a large quantity of honey in order to make wax, the modern bee-keeper effects a considerable saving in this respect by using the same comb several times. This practice, however, withholds a considerable quantity of wax from the market. The modern custom of retailing honey in the comb, owing to the ease with which extracted honey can be adulterated, likewise prevents a quantity of wax from finding its way to the market as such.

In consequence of the inability of European and other countries where modern methods of bee-culture are practised, to meet the increasing demands of manufacturers for this product, the markets have come to depend more and more for their supplies on countries where the wax produced by wild bees is collected and exported. This industry is at the present time attracting a considerable amount of attention, especially in Eastern, Central, and Western Africa, and for that reason it is of interest to give some account of the methods adopted in preparing beeswax for the market.

Wild wax seldom equals the cultivated product in quality, and this is frequently due to careless methods of preparing it for export, and to adulteration. By paying more attention to the few simple details connected with the process of preparing beeswax for export, it would be possible to produce wax from wild bees almost equal in quality to the European article and which would command a similar price on the market.

There are several methods of "rendering" wax as the process of separating wax from honey and impurities is termed, and in some countries special appliances are in use for this purpose. In many cases, however, these appliances are too delicate or too complicated in structure for native use and in such countries one or other of the following simple methods is recommended.

The melting of beeswax can be effected either by using sun heat, direct fire heat, boiling water or steam. In a melted state beeswax readily separates from such foreign substances as may be contained in it, and owing to its lower specific gravity will float on the surface of the matter.

A simple method of rendering wax, and one formerly adopted by bee-keepers in this country and elsewhere is to extract as much honey as possible from the comb, first by draining and then by pressure in a press of the ordinary copying-press type, and finally by melting it in presence of water, which dissolves out any residual honey which may cling to the pressed wax. While melted, the wax is strained through calico to remove solid impurities, and is finally re-melted over a fire to remove water, after which it is poured into moulds to set. Care is required in carrying out the final melting as burning may occur, and when this happens a dark-coloured wax of low market value is produced.

Another method followed by bee-keepers who have not adopted modern appliances is to place the comb, after the honey has been extracted, in a canvas bag which is kept below the surface of water, contained in a copper or other large vessel, by being weighted with stones. If the comb contains "brood" it is allowed to soak in water for twenty-four hours before being placed in the copper, the object being to fill the dry cacoons with water, which will prevent them absorbing the melted wax. The water in the copper is next heated, and as the wax melts it passes through the canvas bag and rises to the surface of the water, leaving behind in the bag all solid impurities. The bag is then out of the copper and squeezed between two pieces of wood to extract as much wax as possible, and the surface of the melted wax in the copper is frequently skimmed to remove scum and other impurities. A cloth is then thrown over the vessel, and the wax and water allowed to cool as slowly as possible. The wax solidifies into a cake, which can easily be removed from the water. On the under side of the cake there is usually a discoloured layer containing impurities, and this is scraped off and worked up with the next batch of crude wax. The remainder is broken up into small pieces, re-melted and poured into moulds to set. Provided that care is taken (1) not to boil the water too fast or for too long a time, and (2) to prevent burning during the final melting, this method produces clean wax of good colour; but if either of these precautions be neglected it becomes dry and brittle, and of a brownish hue. The outfit required for the foregoing operations is simple and obtainable almost everywhere.

Of the modern appliances for rendering wax one of the simplest is the "Solar wax extractor," which is in common use in the United States, Australia, and elsewhere. This consists of a wooden box with a sloping double glazed lid. Inside the box, and raised some distance from its floor, an inclined tin tray is fixed. The comb is placed on the tray, the lid tightly closed, and the box exposed to the sun. The temperature inside the box rapidly rises, and when it reaches about 147 F. the wax melts and runs off the sloping tray into a vessel beneath, leaving impurities behind, caught by a wire gauze strainer. This appliance is admirably suited to warm countries, and wax obtained by its use is of good quality, and requires no further refining. It is, however, not suitable for rendering comb containing brood or other gross impurities. In treating comb of this description it is best to extract the wax by one of the methods mentioned above, and then to clarify it by means of the "Solar extractor." Most of the other appliances are provided with a screw press by means of which the wax is forced through strainers after being melted by means of hot water or steam.

INDUSTRIAL LABORATORIES IN ITALY.

We take the following from the *Society of Arts Journal*:—

Appreciating the importance of applying scientific methods in its industrial development, if it is to solve successfully the great problems of reconstruction and to meet competition from other nations whose industries are more highly organized, Italy is devoting special attention to the questions of industrial experiment stations and of technical education. The necessity for such action is made more urgent by the adoption, in many industries, of an eight-hour day. If the working day be shortened to eight hours, increased efficiency in manufacturing methods must be brought about if production is to be maintained.

In this connection the Italian Government, together with the manufacturers, is establishing experiment stations for the principal lines of industry. In addition to studying new processes and making new applications of old methods, these stations will supply the industries with a trained *personnel*.

According to a report by the United States Trade Commissioner at Rome, four stations have been established—two at Milan, for paper and fats respectively, and two at Naples, for leather and ceramics. Another is being established at Reggio Calabria for essential oils and perfumes, and three more are to be established as follows: At Rovigno, for the sugar industry, in connection with the existing school of beet culture; at Milan, for the development of the refrigerating industry; a third, probably at Rome, to study the distillation of gases and their by-products, and, in general, all the processes of combustion. One section of this last-named station will devote itself to the question of the utilization of national fuels and lignite. Later on consideration will be given to the creation of stations, on the initiative of the manufacturers, for the electro-technical and photo-technical industries and for dyestuffs.

In order that the standard of vocational education might be raised, provision was made at the end of 1918 for the establishment of laboratory schools. At first there will be twenty of these schools, of which two will be at Milan. In addition to a Government subsidy of 25,000 lire each, the laboratory schools will receive appropriations from the local authorities and the obligatory support of the manufacturers. The schools established during the war at Turin, Milan, Genoa, Modena, Florence, Rome, Naples, and Palermo, will be transformed into laboratory schools. Provision will also be made for the ordinary industrial schools, in all of which short courses of study, both practical and theoretical, will be instituted.

BOOKS IN BRIEF.

Industry and Finance—*(Supplementary Volume). Edited by Adam W. Kirkaldy, M.A. Published by Authority of the Council of the British Association—Sir Isaac Pitman & Sons. Ltd., London, E. C. 4.*

This supplementary volume containing the results of inquiries arranged by the Section of Economic Science and Statistics of the British Association during the years 1918 and 1919 has been edited by Mr. Kirkaldy with great care. It adds to and brings up-to-date to the volume published in 1918 regarding the replacement of men by women in industry, and the chronological account of events connected with currency and banking. The volume is divided into two sections—the first being made up of five chapters—one devoted to a general survey of replacement of men by women in industry, another to replacement in the engineering and metal trades, a third to replacement in the clothing trades, a fourth to replacement in communication and transport, and the fifth to a consideration of the position of women in industry. Section II has likewise five chapters—one being devoted to the banking position, the second to currency, the third to foreign exchanges, the fourth to War Finance and the fifth to the results of inflation. The book is one that every student of current Economics should possess.

John Murray III—*1808-1892.—A Brief Memoir by John Murray IV—Published by John Murray—Price 3sh. 6d. net.*

We have in this book drawn for us a very pleasing picture of John Murray III, the father of the present head of the great firm of publishers, under whom the house flourished and became even better known. His business instinct, his literary tastes, his many friendships and a great many other things are refered to by Mr. John Murray in a manner which is both happy and informing. John Murray III interests us because he was so human in his traits. His business led him into literary friendships and these proved of a life-long kind. Mr. Murray's "Guides" were his invention and we can say of his Indian Guide by Eastwick that it is a model of its kind. We have tested it most closely and it has never failed. It should be news to many that Baedeker's *Guides* were modelled on his. This is proved conclusively in Mr. Murray's article on the subject extracted in this volume. Mr. Murray has, we think, done well in reproducing his "Quarterly" article in book form. He has by doing so not only discharged a filial but also a public duty.

Forty-four Months in Germany and Turkey. *By Har Dayal, M.A. Published by P. S. King & Son, Ltd., Westminster, London.*

This is a book of impressions by an extreme Indian, who spent the major part of the War period in Germany and Turkey. He depicts in terms pretty plain what he thinks of the people of these two countries. It is impossibe to read this book how easily men can be misguided. It is, however, something that recantation is not considered impossible even by them.

The current number of the *Bulletin of the Imperial Institute* (John Murray) discusses in detail the possibility of utilising the large quantity of seed now being produced on rubber plantations. In the early stages of the rubber industry in the Middle East the seeds were mostly used for raising plants for making new plantations, but as there are now at least 1,000,000 acres under rubber trees the quantity of seed available is much in excess of the planting requirements. It was shown many yeary ago by investigations made at the Imperial Institute that the kernels of Para rubber seeds yield a large amount of oil similar in properties to linseed oil and that oil can be used for paint-making and other purposes for which linseed oil is employed, whilst the cake which is left after the oil has been removed from the kernels is an excellent feeding-stuff for live-stock. Until the last year or two, the oil had only been produced on an experimental scale, but at least one oil mill is now established in Malaya for crushing rubber seeds and small commercial consignments of the oil have been sold recently in this country and in Marseilles at good prices. Whether it will pay the planter to supply the seeds to an oil mill depends very largely on the cost of collection, a point on which experts differ. In view of the present necessity for the exercise of rigid economy on rubber estates and of the enormous demand for oils and feeding-stuffs, it is highly desirable that serious efforts should be made to organize the collection of Para rubber seed wherever it is likely to prove at all profitable and so prevent waste of material which is undoubtedly of considerable value.